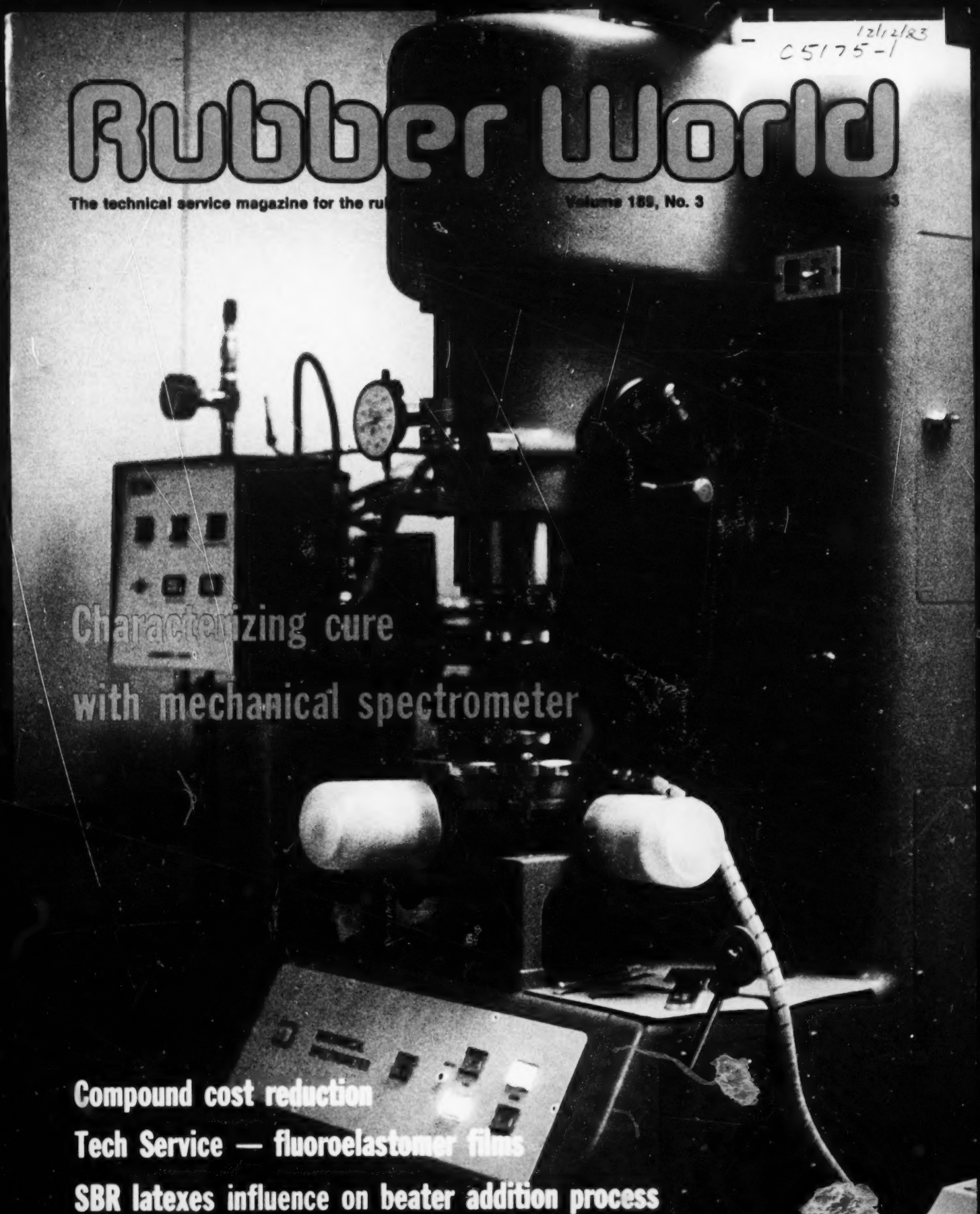
12/12/23
C5175-1

# Rubber World

The technical service magazine for the ru

Volume 189, No. 3



## Characterizing cure with mechanical spectrometer

**Compound cost reduction**

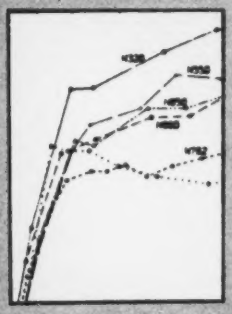
**Tech Service — fluoroelastomer films**

**SBR latexes influence on beater addition process**

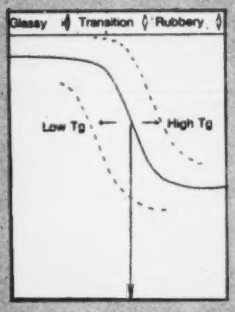
# Rubber World

Volume 189/Number 3/December 1983

Cure characteristics p. 15



Cost reduction p. 26




SBR latex p. 36

## News


7 **Business Briefs**

11 **RMA tire and rubber reports**

11 **Carbon black quarterly figures**

44 **Meetings**


## Tech Service


12 **Tech Service — Fluoroelastomer films: New solutions for old problems**
by Jon Menough, contributing technical service editor

15 **Characterization of rubber cure with the Rheometrics mechanical spectrometer**
by H. Earl Hill, Lord Corp.

26 **An approach to compound cost reduction**
by John T. Byers, Ashland Chemical Co.

36 **Characteristics of styrene butadiene latexes and their influence on beater addition process and products**
by J.C. Kwok and R.J. Thompson, Polysar Ltd.

43 **New Patents**
edited by Bob Samples, Akron Rubber Development

49 **Techno Mart**


## Departments


4 **Editorial**

5 **Mailbag**

6 **Calendar**

57 **Jobs & People**

58 **New Literature**

60 **Advertisers Index**


## Cover

**Cover photo courtesy of Lord Corp.**

## Carbon black industry in the U.S. (metric tons)

| | | 1983 1st half | Percentage Change 1st half '83 vs. 1st half '82 |
|---|---|---|---|
| N-100 (SAF) | Prod. | 10,521 | +14.8% |
| | Ship. | 9,632 | +15.1% |
| N-200 (ISAF) | Prod. | 57,366 | +3.8% |
| | Ship. | 58,651 | +6.3% |
| N-300 (HAF) | Prod. | 241,077 | +2.5% |
| | Ship. | 242,098 | +3.2% |
| N-500 (FEF) | Prod. | 45,016 | (15.8%) |
| | Ship. | 46,305 | (16.2%) |
| N-600 (GPF) | Prod. | 133,998 | (5.5%) |
| | Ship. | 138,436 | +1.4% |
| N-700 (SAF) | Prod. | 52,770 | +10.4% |
| | Ship. | 55,524 | +8.2% |
| Total | Prod. | 540,742 | (0.4%) |
| | Ship. | 550,646 | +1.7% |
| Domestic Shipments (Included Above) | | 540,537 | 2.8% |
| Domestic Share | | 98.2% | |

## SBR black rubber production (metric tons)

| | 1983 1st half | Percentage Change 1st half '83 vs. 1st half '82 |
|---|---|---|
| Net Polymer | 60,269 | (18.6%) |
| Oil | 23,981 | (23.7%) |
| Oil % of Net Polymer | 39.8% | |
| Net Rubber | 84,250 | (20.2%) |
| Net Rubber % of Dry SBR | 21.0% | |
| Carbon Black | 40,890 | (7.9%) |
| Total SBR Black Rubber | 125,140 | (16.6%) |

More movement was announced in the domestic carbon black scene as **Ashland** announced an agreement to sell its U.S. carbon black division to **Bass Brothers Enterprises. Sid Richardson Carbon** manages all carbon black operations for Bass Brothers. Also, **Consolidated Minings & Industries S.A.**, recent purchaser of Columbian Chemicals signed a letter of intent to purchase **Continental Carbon** from **Conoco**. Sid Richardson will be getting three of Ashland's carbon black facilities along with a customer technical service laboratory in Akron. The plants are in Aransas Pass, TX with a 100 million pound capacity, Belpre, OH with a 120 million pound capacity and the 200 million pound active capacity New Iberia, LA plant. Ashland is selling its foreign carbon black operations to Cabot. Consolidated Mining would become the largest domestic producer when the deal is concluded adding Continental's Phenix City AL (55 million pounds), Ponco City, OK (132 mil/lbs.), and Sunray, TX (98 mil/lbs.) plants to the 640 million pound capacity purchased in the Columbian deal.

**VenBLACK, Inc.**, a group of investors, acquired the Austin Black operations of **Slab Fork Coal** in Tams, WV.

## [illegible] (Figures in thousands of units)

| Passenger Tires | 1983 | 1982 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 23,428 | 20,687 | +13.25 |
| Radial | 19,531 | 17,323 | +12.75 |
| Replacement | 77,668 | 75,161 | +3.34 |
| Radial | 53,397 | 48,013 | +11.21 |
| Export | 2,100 | 1,691 | +24.19 |
| Radial | 1,389 | 889 | +56.24 |
| Total | 103,196 | 97,539 | +5.80 |
| Radial | 74,317 | 66,225 | +12.22 |
| Production | 89,601 | 87,913 | +1.92 |
| Radial | 62,242 | 59,175 | +5.18 |
| Ending Inventory | 30,294 | 32,908 | −7.94 |
| Radial | 22,515 | 24,007 | −6.21 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 2,899 | 3,018 | −3.94 |
| Radial | 1,322 | 1,137 | +16.27 |
| Replacement | 16,104 | 15,771 | +2.11 |
| Radial | 5,231 | 4,520 | +15.73 |
| Export | 578 | 573 | +0.87 |
| Radial | 284 | 149 | +90.60 |
| Total | 19,581 | 19,362 | +1.13 |
| Radial | 6,837 | 5,806 | +17.76 |
| Production | 17,169 | 17,286 | −0.68 |
| Radial | 5,251 | 4,325 | +21.41 |
| Ending Inventory | 6,695 | 7,855 | −14.77 |
| Radial | 2,591 | 2,7582 | −5.85 |

## [illegible] through July 1983 (figures are expressed in metric tons)

| | Cumulative 1983 | Cumulative 1982 | % Change 83 vs 82 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 1,629,860 | 1,594,716 | 2.20 |
| Imports | 500,049 | 449,546 | 11.23 |
| Exports | 182,625 | 198,500 | −8.00 |
| Apparent Consumption | 1,407,517 | 1,420,419 | −.91 |
| **Total Natural Rubber** | | | |
| Imports | 406,452 | 375,375 | 8.28 |
| Exports | 10,148 | 8,298 | 22.29 |
| Apparent Consumption | 392,316 | 388,071 | 1.09 |
| % Total new rubber | 27.87 | 27.32 | |
| **Total Synthetic Rubber** | | | |
| Production | 1,129,811 | 1,145,170 | −1.34 |
| Imports | 93,597 | 74,171 | 26.19 |
| Exports | 172,477 | 190,202 | −9.32 |
| Apparent Consumption | 1,015,200 | 1,032,348 | −1.66 |
| % Total new rubber | 72.12 | 72.67 | |
| **Total SBR** | | | |
| Production | 517,719 | 529,669 | −2.26 |
| Imports | 31,676 | 30,263 | 4.67 |
| Exports | 47,533 | 52,858 | −10.07 |
| Apparent Consumption | 497,714 | 502,924 | −1.04 |
| **Total Nitrile** | | | |
| Production | 30,181 | 29,457 | 2.46 |
| Imports | 5,017 | 4,645 | 8.01 |
| Exports | 3,619 | 3,754 | −3.60 |
| Apparent Consumption | 31,396 | 31,345 | .16 |
| **Polybutadiene** | | | |
| Production | 188,004 | 177,116 | 6.15 |
| Imports | 23,781 | 17,168 | 38.52 |
| Exports | 9,065 | 8,306 | 9.14 |
| Apparent Consumption | 193,693 | 186,932 | 3.62 |
| **Ethylene-Propylene** | | | |
| Production | 96,914 | 77,755 | 24.64 |
| Imports | 231 | 108 | 113.89 |
| Exports | 18,236 | 17,726 | 2.88 |
| Apparent Consumption | 75,592 | 66,741 | 13.26 |

CS175-14

# Rubber World

The technical service magazine for the rubber industry Volume 189, No. 4 January 1984

# TECHNICAL SERVICE '84

Featuring:

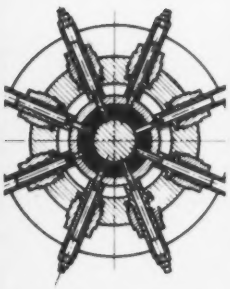
1st annual tech service survey

Roundtable discussion on tech service

Supplier & Independent lab directories

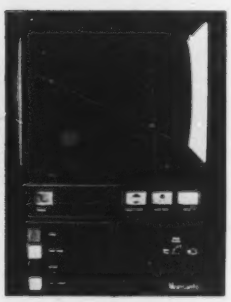
# Rubber World

**The technical service magazine for the rubber industry**

Pin barrel extruders examined p. 14

Technical service '84, results of first annual survey, roundtable discussion, suppliers and independent testing lab directories p. 18



Techno Mart highlights new microprocessor instrumentation p. 55


**6 Briefs**
acquisitions, expansions; contracts, licenses; financial statements, markets and news

**12 Tech Service — Obstructing flow to improve productivity**
by Jon Menough, contributing technical service editor. A look at the pin barrel extruder, its evolution, use and applications.

**18 Technical service — top priority in choosing a supplier**
by Joseph Kuebler, business editor. Results of *RW's* first annual survey of rubber products manufacturers, suppliers and independent testing laboratories.

**22 What is technical service?**
A lively, informative roundtable discussion of current technical service, its direction, advantages, problems with seven industry representatives from manufacturing, suppliers and testing labs.

**31 Suppliers directory**
First annual directory of rubber suppliers and the technical services offered. Followed by a cross reference section showing areas of expertise.

**47 Independent testing laboratories directory**
Listings of independent test labs along with areas of specialty.

**53 New Patents**
edited by Bob Samples, Akron Rubber Development

**55 Meetings**
The Rubber Division's spring meeting; Rubberplas '84; Rubberex '84; Rubber Group news and calendar of events.

**58 Techno Mart — Microprocessor control of instruments**
edited by David Given, technical editor. A look at new computer controlled instrumentation along with new CAD/CAM applications, instruments, equipment.


## Departments


4 **Editorial**
65 **Jobs & People**
68 **New Literature**
72 **Advertisers Index**

**The BASF Group**, West Germany, reported sales for the first three quarters was $9.6 billion and pre-tax profits were $389 million.

**Compo Industries** reported fourth quarter revenues of $20.8 million and net income of $482,000. Revenues for the year were $87.8 million and net income was $282,000.

**Dayco** had fourth quarter sales of $217.1 million and net earnings of $6.5 million. Yearly figures were sales of $718.7 million and earnings of $4.3 million.

**Exxon** had a third quarter net income of $1.2 billion on revenues of $23.3 billion.

**Jones & Vining** reported net earnings for the third quarter were $224,000 on sales of $7.4 million.

**Myers Industries** had a third quarter net income of $902,020 on sales of $20.3 million.

**Brad Ragan Inc** reported second quarter earnings of $875,000 on revenues of $48.2 million.

## Markets, news

**Goodyear Tire** and **Firestone Tire** both see continued improvement in tire sales for 1984, with Goodyear predicting slightly more units sold. Goodyear chairman Robert Mercer said "a slimmed down tire industry will have to push its capacity in 1984 to meet the expected total demand for 187 million auto tires, including 4 million exports." This would represent the largest requirement for tires in five years and would represent an increase of more than 2% above expected 1983 figures. Goodyear sees a 5% increase in original equipment tires to 47 million but only a slight increase in replacement tires from 135 million tires in 1983 to 136 million in 1984. Truck tire sales should increase by about 800,000 units as well. Firestone agrees with the replacement auto figures but predicts 48 million oe passenger tires will be sold.

U.S. consumption of adhesives and sealants will expand by 60%, climbing from 9 billion pounds to nearly 15 billion pounds in 1995 according to **Predicasts, Inc.** This demand increase will be coupled with a trend toward more expensive, high-performance adhesive and sealant formulations which will result in a four-fold jump in the market's dollar value from $6.5 billion in 1982 to $25 billion by 1985. Predicasts cites hot melts, acrylics, epoxies and polyesters as the formulations expected to demonstrate exceptional market gains.

A task force set up by the Malaysian government predicts the demand for natural rubber would rise to about 5 million tons in 1990 and to 6 million tons by the year 2000. The task force advocated that steps be initiated "without delay" to increase that country's natural rubber production primarily through efforts to raise production efficiency.

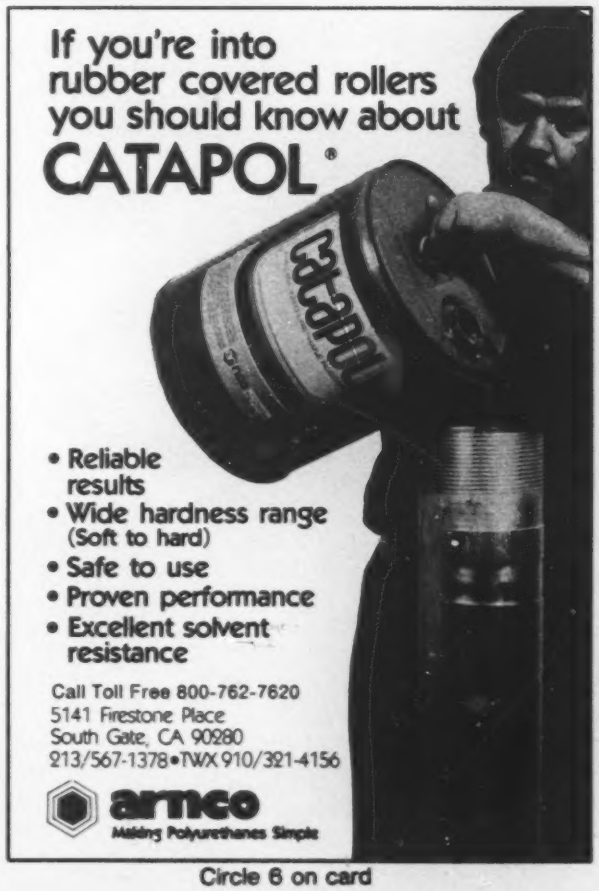
Production of lead free zinc oxide for the first nine months of 1983 was up 9% over the previous year with production at a little more than 98,000 metric tons.

In a joint statement by George Langstaff, president of Footwear Industries of America and two AFL-CIO unions the action by the Melville Corp./Thom McAn to halt almost all domestic shoe production they said "we are saddened, we are angry, and we are frustrated . . . but we are not surprised. Today's closing was announced on the same day that the government released figures showing that shoe imports surged 62% in October as compared with October 1982. This is the highest monthly percentage increase in history. Melville's closings are a direct result of the unprecedented and uncontrolled flood of imported shoes into the U.S. market."

RMA monthly tire & tube shipments & production report through September 1983
(Figures in thousands of units)

| | 1983 | 1982 | % Change |
|---|---|---|---|
| **Passenger Tires** | | | |
| Shipments | | | |
| Original Equipment | 31,380 | 25,907 | +21.13 |
| Radial | 26,190 | 21,692 | +20.74 |
| Replacement | 103,034 | 99,937 | +3.10 |
| Radial | 71,185 | 64,722 | +9.99 |
| Export | 2,939 | 2,125 | +38.31 |
| Radial | 1,990 | 1,140 | +74.56 |
| Total | 137,353 | 127,969 | +7.33 |
| Radial | 99,365 | 87,554 | +13.49 |
| Production | 117,057 | 113,803 | +2.86 |
| Radial | 81,722 | 77,517 | +5.42 |
| Ending Inventory | 27,173 | 31,855 | −14.70 |
| Radial | 20,397 | 24,203 | −15.73 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 3,881 | 3,637 | +6.71 |
| Radial | 1,771 | 1,427 | +24.11 |
| Replacement | 22,141 | 21,203 | +4.42 |
| Radial | 7,229 | 6,140 | +17.74 |
| Export | 765 | 730 | +4.79 |
| Radial | 366 | 201 | +82.09 |
| Total | 26,787 | 25,570 | +4.76 |
| Radial | 9,366 | 7,768 | +20.57 |
| Production | 22,513 | 21,759 | +3.47 |
| Radial | 6,903 | 5,611 | +23.03 |
| Ending Inventory | 5,681 | 6,830 | −16.82 |
| Radial | 2,234 | 2,623 | −14.83 |

**General Tire** announced that the remaining manufacturing operations at its Plant 1 facility in Akron, OH will

Circle 6 on card

RMA industry rubber report through August 1983
(figures are expressed in metric tons)

| | Cumulative 1983 | Cumulative 1982 | % Change 83 vs 82 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 1,830,856 | 1,806,768 | 1.33 |
| Imports | 550,542 | 516,125 | 6.67 |
| Exports | 205,761 | 223,343 | −7.87 |
| Apparent Consumption | 1,622,330 | 1,636,507 | −.87 |
| **Total Natural Rubber** | | | |
| Imports | 438,860 | 430,369 | 1.97 |
| Exports | 11,232 | 10,072 | 11.52 |
| Apparent Consumption | 432,115 | 453,705 | −4.76 |
| % Total new rubber | 26.63 | 27.72 | |
| **Total Synthetic Rubber** | | | |
| Production | 1,280,314 | 1,290,643 | −.80 |
| Imports | 111,682 | 85,756 | 30.23 |
| Exports | 194,529 | 213,271 | −8.79 |
| Apparent Consumption | 1,190,214 | 1,182,802 | .63 |
| % Total new rubber | 73.36 | 72.27 | |
| **Total SBR** | | | |
| Production | 587,138 | 602,009 | −2.47 |
| Imports | 37,420 | 34,989 | 6.95 |
| Exports | 53,015 | 60,291 | −12.07 |
| Apparent Consumption | 582,683 | 576,976 | .99 |
| **Total Nitrile** | | | |
| Production | 35,048 | 32,969 | 6.31 |
| Imports | 6,068 | 5,243 | 15.74 |
| Exports | 4,193 | 4,293 | −2.33 |
| Apparent Consumption | 36,600 | 35,190 | 4.01 |
| **Polybutadiene** | | | |
| Production | 209,998 | 197,607 | 6.27 |
| Imports | 27,890 | 19,979 | 39.60 |
| Exports | 10,196 | 9,386 | 8.63 |
| Apparent Consumption | 223,862 | 214,764 | 4.24 |
| **Ethylene-Propylene** | | | |
| Production | 111,138 | 89,379 | 24.34 |
| Imports | 380 | 176 | 115.91 |
| Exports | 20,343 | 19,937 | 2.04 |
| Apparent Consumption | 88,526 | 76,232 | 16.13 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 260,381 | 286,310 | −9.06 |
| Imports | 37,401 | 24,431 | 53.09 |
| Exports | 76,151 | 85,329 | −10.76 |
| Apparent Consumption | 205,656 | 231,601 | −11.20 |

be discontinued. Tire production was halted at the facility in 1982 and since that time the plant has produced bladders for curing presses and tire machine parts. It is anticipated complete shutdown will take 12-18 months. The company also announced it will phase out its tire development workshop operations in Akron by the end of 1984. The operation is being moved to General's Mount Vernon, IL tire plant.

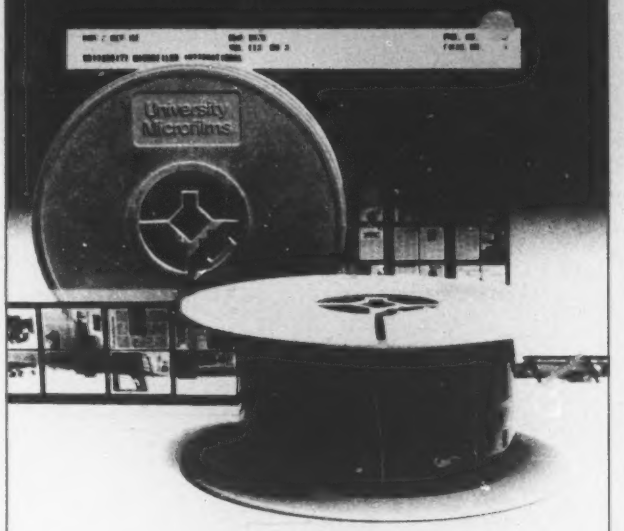
The **Lubrizol Corp.** announced it is closing its polybutene plant at Port Arthur, TX.

**Sun Co.** will close three lubricant manufacturing facilities at the Marcus Hook, PA refinery. In addition, Sun is in the process of divesting its European lube marketing operations. Sun said the closings will allow the company to become more cost competitive and will continue manufacturing solvent lube oils at refineries in Tulsa, OK and Yabucoa, Puerto Rico.

The **Armak Co.** changed its name to Akzo Chemie America. Included under this banner will be Armak Chemicals, Noury Chemicals, Ketjen Catalysts, Pioneer Chemicals and Interstab Chemicals.

The U.S. Food and Drug Administration ordered domestic manufacturers of rubber baby-bottle nipples not to exceed 60 parts per billion of nitrosamines in their products. The RMA said the makers should be able to comply.


This publication is available in microform.




University Microfilms International

Please send additional information for _____
(name of publication)
Name _____
Institution _____
Street _____
City _____
State _____ Zip _____

300 North Zeeb Road
Dept. P.R.
Ann Arbor, Mi. 48106
U.S.A.

30-32 Mortimer Street
Dept. P.R.
London W1N 7RA
England

***RW* survey shows**

# Tech service — top priority to manufacturers

*by Joseph Kuebler*
*business editor*

Quality has been a major factor in the manufacturing process for many a day but it is a safe bet that never has the emphasis on trouble-free products been as pronounced as it is today.

One of the better examples of this can be found in the auto industry where the impressive showing of foreign-made vehicles has stimulated the consumer push for quality.

Consumers are not alone in this quest, however. Poor quality hits producers where it hurts the most — in the pocketbook, since warranty costs have become atrociously high, Richard C. Edwards, an automotive consultant, points out.

"Better quality also contributes to customer satisfaction which can lead to repeat sales," he adds.

The automobile companies have been stressing quality in the products supplied to them. Ford Motor's quality campaign has received widespread attention and suppliers have been quick to get the message that this is not just advertising hype.

"If they don't meet the specs they are not suppliers very long . . . it's that simple," Ed Francis of Ford's chassis engineering office said.

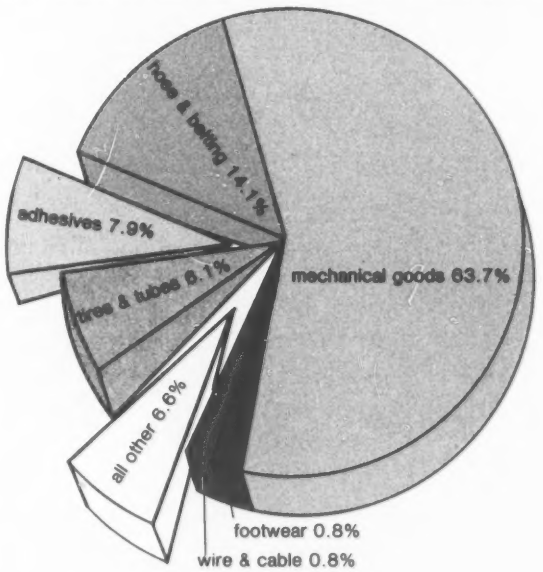
Reports from other car manufacturers carry a similar tune which can explain why rubber products manufacturers are more concerned with the quality of its products and are turning to its suppliers for assistance. A recent survey conducted by *RW* bears this out. It shows that manufacturers are leaning heavily on the suppliers with technical service capabilities. Nearly three out of every four manufacturers surveyed chose a supplier because of its tech service ability.

Included in the survey were 210 rubber product manufacturers, chosen at random. About 64% of those were primarily producers of mechanical rubber goods, hose and belting accounted for 14% of the products, adhesives 8% and tires and tubes 6%.

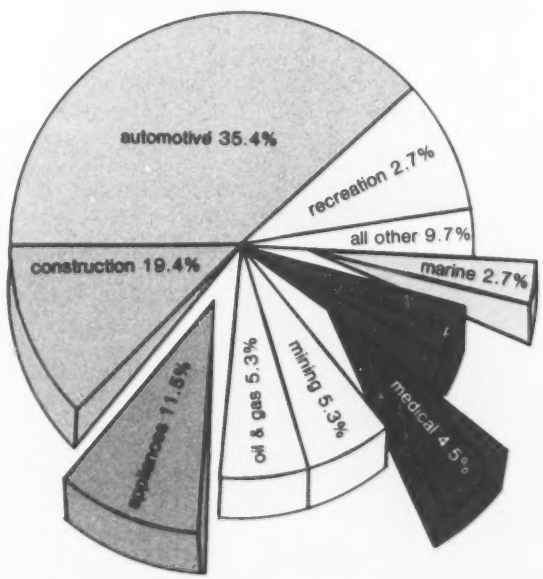
Automotive is still the largest market served with 35% of the respondents claiming it their principle market. Construction accounted for 19%, appliances 11%, oil and gas and mining each accounted for 5.3% followed by medical at 4.5% and agriculture 3.5%.

When a manufacturer chooses a supplier because of the tech service capabilities, he is seeking solutions to compounding problems more than anything else. 44% said this is the main capability they look for in a supplier. 25% said they are interested

**Principle products of manufacturers surveyed**




**Main end markets served by manufacturers**



in development testing and 18% in laboratory testing.

When it came to the question of how often manufacturers used the tech service facilities of their suppliers, nearly 42% replied often, 29.5% occasionally, and 28.7% seldom.

Among those who did use the services of their suppliers, an overwhelming majority, just under 95%, noted they were satisfied. Of the same number who were not pleased, the complaints almost invariably cited "slow response" by the supplier.

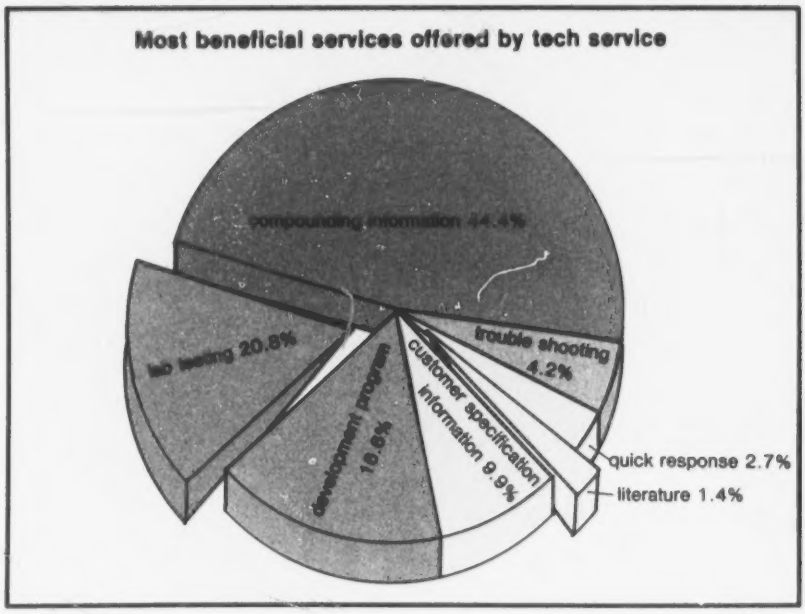
Some 44% of the manufacturers found compounding information as the most beneficial service provided by their suppliers; 20.8% said it was laboratory testing and 16.6% liked development programs.

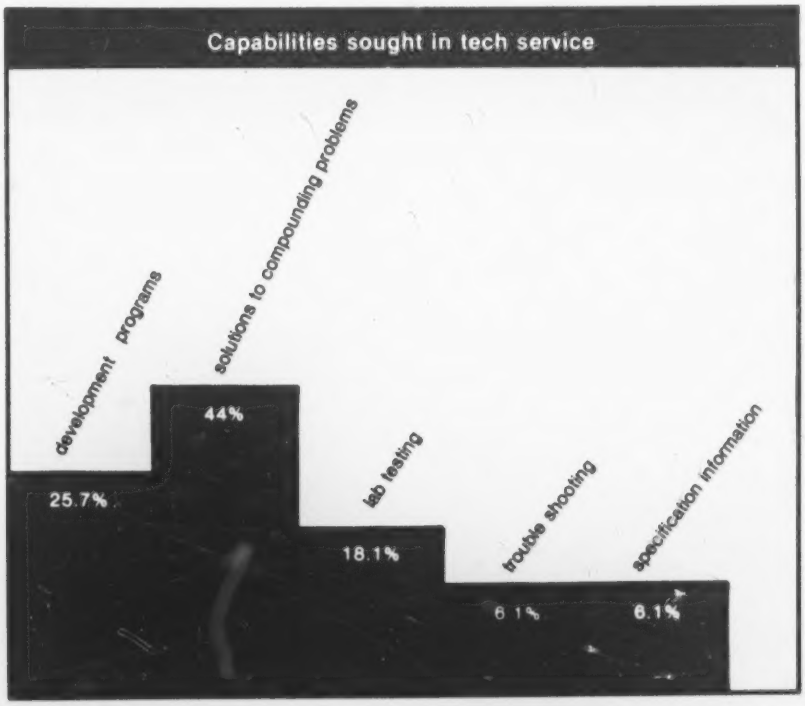
The question of what can suppliers do to improve their tech service capabilities brought a variety of suggestions but most included faster response; a call for expanded capabilities with more tech service people available; furnish information with greater detail, and have tech service people travel with sales people more often.

One eastern manufacturer recommended that suppliers stay close to their customers — "don't just be available if the need arises." He thinks this can be mutually beneficial.

Another expressed the thought that suppliers with their tech service capabilities should be more practical with their recommendations, "keeping in mind we are a production facility, not an experimental operation."

Some of the manufacturers expressed concern that suppliers were cutting back on their technical service and some said the quality of personnel has slipped. "Suppliers who use an 800 phone number for customer technical service and staff the operation with people who simply read from available literature are doing themselves a disservice," one said.




**Suppliers**

A separate survey of suppliers showed the great majority (76%) were convinced their tech service was becoming more and more important as part of their business.

They cited as reasons for this viewpoint: increasing customer demand; the fact that products are becoming more sophisticated; the increasing number of product lines; customer insistence on higher quality; the trend toward specialization, plus the fact that fewer of their customers have tech service facilities.

There were 75 respondents to the supplier survey spread out among product mix and geographical area.

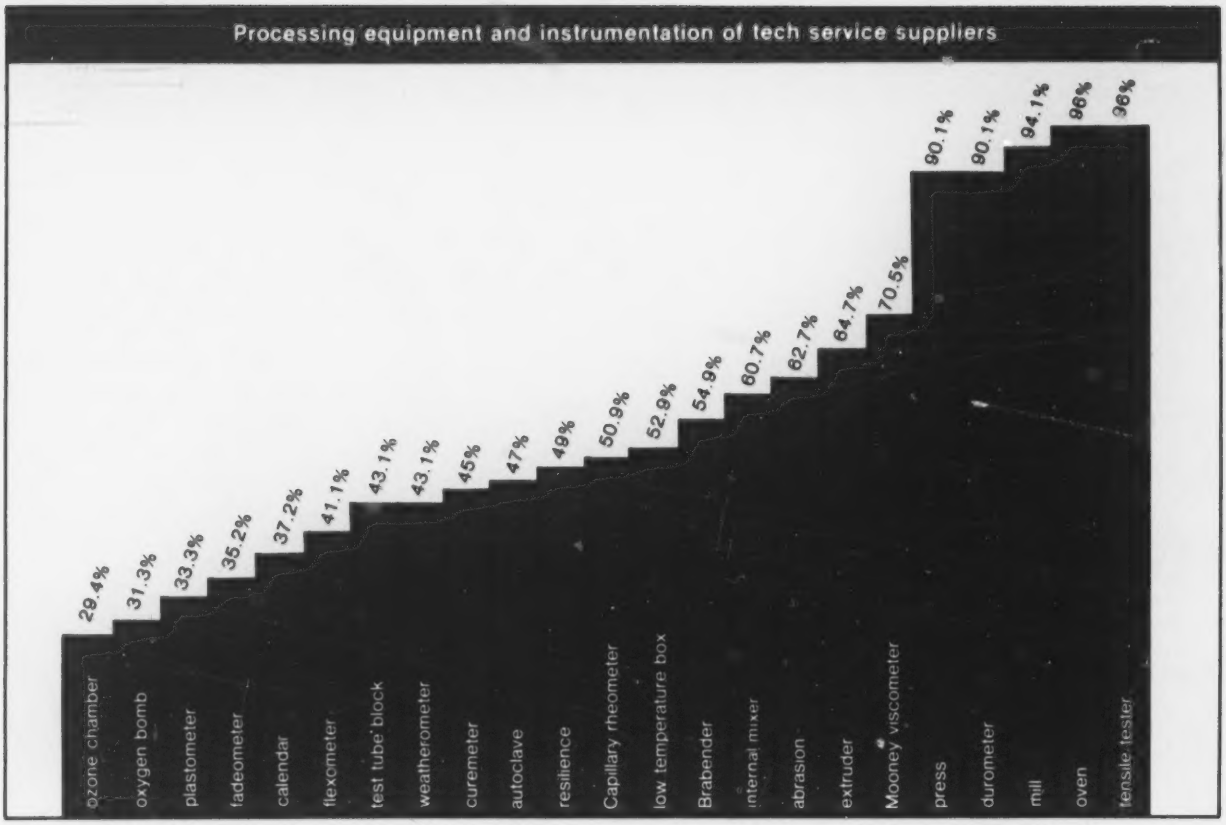
When it came to the question of whether their tech service is available to both customers and non-customers, just over half replied it was for customers only, while 49.2% said it was for both groups.

However, the big majority offer the service only to customers or strongly potential customers. Some have a rule of "customers free — non-customers pay."

Most suppliers (56.2%) reported that their tech service capabilities increased in the last five years; 37.6% said their's was the same, and 6.2% noted a decrease.

Looking ahead, 47% revealed they plan to increase their tech service facilities this year vs. 50.9% who plan no changes.

To achieve greater tech service capabilities in '84, more than half




(52%) disclosed they plan to purchase additional processing and instrumentation equipment.

The survey also revealed that 96% of all the respondents had tensile testers and ovens; 94% owned mills; 90% owned both presses and durometers; 70% Mooney viscometers; 64.7% extruders; and 62.7% abrasion equipment.

Only 8.8% had all 23 pieces of equipment listed in the survey; 32% had 12 to 22 pieces, and 60% from 1 to 11 pieces.

The number of people on tech service staffs of companies participating in the study varied from two to 25 with the average at 16.

**Independent labs**

Questionnaires sent to independent testing labs showed 66% experienced business increases in the last five years, 27% were about the same and only 6% reported business decreases. Increases incidentally averaged 56% vs. decreases that averaged 20%. 48 labs took part in the survey.

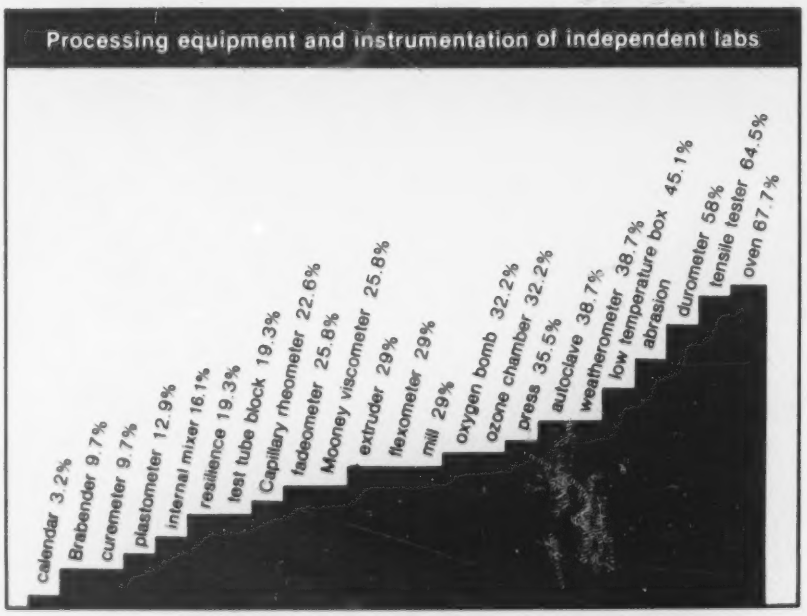
A little over 70% of the labs look for an improvement in business in '84 with 26% expecting volume to remain about the same.

Ovens were the most popular equipment or instrumentation owned by the labs with 67.7% operating such equipment. Then came tensile testers, 64.5%; durometers, 58%; abrasion, 51.6%; and low temperature box, 45%.

Only one respondent had all the listed equipment and instrumentation. The average respondent owned eight pieces of equipment.

When it came to the question of whether the labs had prototype production capabilities, only 36% said yes. Out of the 64% that do not have such equipment, virtually all (95.7%) replied that they do not plan to add such facilities.

Almost two out of three independent labs reported that they assist their customers in developing formulas. **RW**

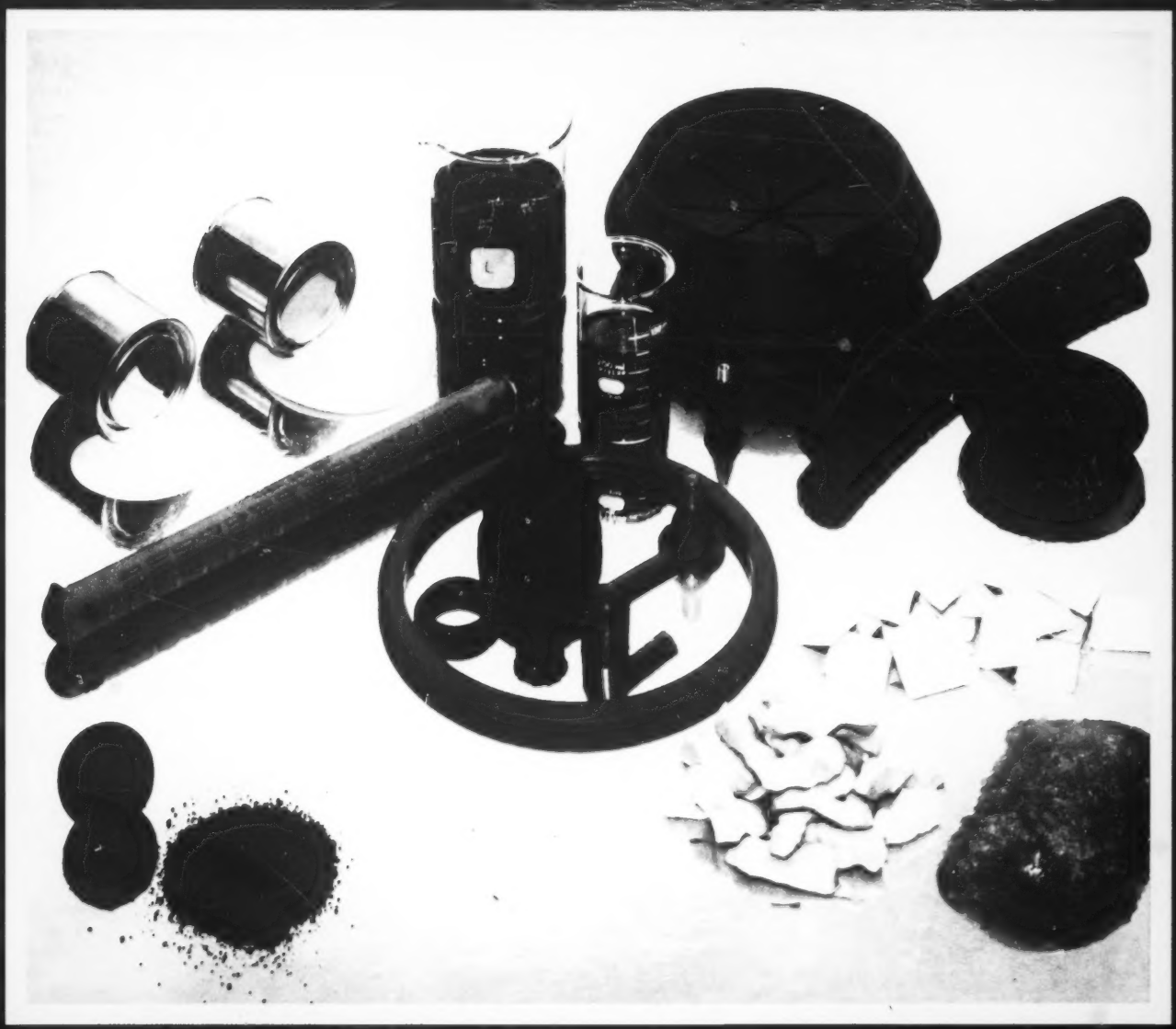


C5175-1 2/14/84

# Rubber World

The technical service magazine for the rubber industry Volume 189, No. 5 February 1984

## Emphasis on custom mixing



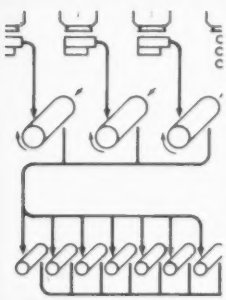
plus: automating mixing plants

intermeshing rotor system

# Rubber World

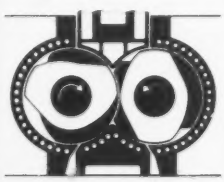
**The technical service magazine for the rubber industry**

Present trends in custom mixing along with a directory of custom mixers p. 17



Automation of the complete rubber mixing facility p. 25

Intermeshing
**GK-E rotor system**



Improving production and quality through the intermeshing rotor system p. 33


**8 Business Briefs**
acquisitions, expansions; contracts, licenses; financial statements; markets and news

**14 Tech Service — Novor: A new link for natural rubber**
by Jon Menough, contributing technical service editor. This unique cross-linking agent that can be used quite effectively with natural rubber is examined.

**17 Custom mixers optimistic about '84**
*RW* survey results of U.S. custom mixers plus an alphabetical directory listing plant locations, types of mixing equipment and polymers mixed.

**25 Automation of rubber mixing plants**
by D. Muller and U. Maire, Buhler-Miag. Complete automation from receiving the raw materials to shipping and inventory are looked at.

**33 Quality and productivity improvements using intermeshing rotor system for internal mixers**
by H.M. Schmid, Werner & Pfleiderer. Author discusses the optimization criteria, laboratory trials and results, the technological aspects and advantages of these systems along with improvements made possible and price/output comparison ratios.

**41 The role of tackifying resins on the tackification of rubber compounds**
by James T. White, Reichhold Chemicals, Inc. The increased emphasis on tackification economics of rubber compounds causes a need to re-examine the role of resin tackifiers.

**46 Meetings**
ACS spring meeting, TIRES '84, ASTM meetings, rubber group news and calendar of events.

**52 New Patents**
edited by Bob Samples, Akron Rubber Development

**54 Techno Mart**
edited by David Given, technical editor. A look at new mixing equipment.


## Departments


4 **Editorial**
6 **Mailbag**
66 **Jobs & People**
68 **New Literature**


## Cover

**Cover photo courtesy of Polymerics Inc.**


A Lippincott & Peto Publication/ Volume 184, No. 5/February 1984

## Price changes

**Goodyear** increased the price of its Versigard rubber membranes in all widths and thicknesses by an average of 8% and the prices for roofing accessories such as sealants, adhesives, flashings, pipe seals, metal fasteners and other items increased an average of 10%.

**Uniroyal** increased the price for all textile reinforced hydraulic hose by 6%.

**Airmac Technology Systems** reduced the price of its five cubic foot shot blast deflashing system by 10% and its one cubic foot system by 12%.

**Himont USA** increased the price of all Pro-fax homopolymer resins by 3¢ a pound and all below list copolymer resin prices will be increased by the same amount. The list price on copolymer blush resistant, medium impact resins will remain at 51¢ lb. in bulk car quantities.

**IISRP North American new rubber consumption forecast (all figures in m metric tons)**

| | 1982 Actual | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|---|
| Styrene butadiene-dry | 864 | 902 | 939 | 956 | 969 | 973 | 997 |
| Styrene butadiene-latex | 87 | 99 | 104 | 107 | 108 | 109 | 114 |
| Polybutadiene | 343 | 364 | 380 | 390 | 401 | 410 | 415 |
| Ethylene-propylene | 117 | 139 | 151 | 160 | 169 | 173 | 180 |
| Polychloroprene | 76 | 86 | 92 | 94 | 96 | 98 | 98 |
| Nitrile-solid | 48 | 51 | 56 | 58 | 60 | 61 | 63 |
| Nitrile-latex | 6 | 7 | 7 | 7 | 8 | 8 | 8 |
| Other synthetic* | 347 | 314 | 318 | 321 | 329 | 327 | 340 |
| Total synthetic | 1,888 | 1,962 | 2,047 | 2,093 | 2,140 | 2,159 | 2,215 |
| Natural rubber | 734 | 752 | 778 | 792 | 809 | 814 | 832 |
| Total new rubber | 2,622 | 2,714 | 2,825 | 2,885 | 2,949 | 2,973 | 3,047 |
| Tire rubber | 1,563 | 1,680 | 1,748 | 1,780 | 1,814 | 1,826 | 1,871 |
| Non tire rubber | 1,059 | 1,034 | 1,076 | 1,105 | 1,135 | 1,147 | 1,176 |
| % synthetic | 72.0 | 72.3 | 72.5 | 72.5 | 72.6 | 72.6 | 72.7 |
| Carboxylated SBR latex | 246 | 287 | 299 | 306 | 306 | 312 | 320 |

*Includes butyl rubber and polyisoprene


BEARFOOT

What's so difficult about BUTYL mixing?

One reason is the problem of contaminants, but the specialists at Bearfoot solved that problem years ago. Solving Butyl and other rubber compound problems is what we do best. This includes:

- Processing in both black and light colors
- Consistency - batch after batch
- Other services such as custom calendering
- Reliable experienced technical advice

*For immediate action call*
*Bill Stoufer or George Broughton*

BEARFOOT CORPORATION
First and Water Streets, Wadsworth, Ohio 44281
216/335-2581

Circle 10 on card


## Markets, news

The International Institute of Synthetic Rubber Producers' North American Section said that rubber consumption appears to have recovered significantly in 1983 although final figures will not be available for some time. The group estimates 1983 consumption for all rubber will be pegged around 1,962 million metric tons up from the 1,888 mmt figure of 1982 but still lower than the level achieved in 1968. Projections for rubber demand show a compound annual growth rate of 2.3% which is slightly below the generally accepted GNP projections of 3-4% annually. Because of the longer wearing and smaller tires, the proportion of total rubber used in tires is projected to decline from 61.9% in 1983 to 61.4% in 1988. During this span however, synthetic rubber is expected to in-

**RMA industry rubber report through September 1983 (figures are expressed in metric tons)**

| | Cumulative 1983 | Cumulative 1982 | % Change 83 vs 82 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 2,060,549 | 2,001,560 | 2.95 |
| Imports | 617,076 | 569,638 | 8.33 |
| Exports | 233,162 | 248,453 | −6.15 |
| Apparent Consumption | 1,845,866 | 1,836,791 | .49 |
| **Total Natural Rubber** | | | |
| Imports | 483,795 | 471,622 | 2.58 |
| Exports | 13,764 | 11,328 | 21.50 |
| Apparent Consumption | 481,750 | 502,459 | −4.12 |
| % Total new rubber | 26.09 | 27.35 | |
| **Total Synthetic Rubber** | | | |
| Production | 1,443,473 | 1,431,922 | .81 |
| Imports | 133,281 | 98,016 | 35.98 |
| Exports | 219,398 | 237,125 | −7.48 |
| Apparent Consumption | 1,364,116 | 1,334,331 | 2.63 |
| % Total new rubber | 73.90 | 72.64 | |
| **Total SBR** | | | |
| Production | 661,744 | 674,237 | −1.85 |
| Imports | 44,357 | 40,490 | 9.55 |
| Exports | 62,894 | 68,248 | −7.84 |
| Apparent Consumption | 659,939 | 657,204 | .42 |
| **Total Nitrile** | | | |
| Production | 39,599 | 36,364 | 8.90 |
| Imports | 6,965 | 5,795 | 20.19 |
| Exports | 4,747 | 4,849 | −2.10 |
| Apparent Consumption | 42,369 | 39,640 | 6.88 |
| **Polybutadiene** | | | |
| Production | 238,088 | 223,310 | 6.62 |
| Imports | 33,670 | 22,561 | 49.24 |
| Exports | 12,348 | 10,774 | 14.61 |
| Apparent Consumption | 256,207 | 242,077 | 5.84 |
| **Ethylene-Propylene** | | | |
| Production | 127,724 | 99,524 | 28.33 |
| Imports | 515 | 179 | 187.71 |
| Exports | 23,288 | 21,822 | 6.72 |
| Apparent Consumption | 103,721 | 87,967 | 17.91 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 293,581 | 309,273 | −5.07 |
| Imports | 43,296 | 27,948 | 54.92 |
| Exports | 84,753 | 94,889 | −10.68 |
| Apparent Consumption | 239,447 | 252,284 | −5.09 |
| **Polychloroprene** | | | |
| Production | 82,738 | 89,214 | −7.26 |
| Imports | 4,478 | 1,043 | 329.34 |
| Exports | 31,368 | 36,543 | −14.16 |
| Consumption | 62,434 | 55,160 | 13.19 |

crease from 72.3% to 72.7% of the total rubber consumed. A large portion of this strength is expected to be in ethylene-propylene rubber in non-tire applications.

EP/EPDM rubbers along with specialty rubbers are seen as growing above industrial production levels in Western Europe according to the IISRP's European Statistical Committee. In their five year forecast, IISRP says general purpose rubbers are expected to grow at levels below industrial production in Western Europe. The Committee says although the economies of the countries in the region are improving, their figures reflect caution about the robustness of the recovery.

General Tire president Warren Hayford resigned from the company. Chairman of the board, M. G. O'Neil assumed the duties of the president, a title he held before the hiring of Hayford less than two years ago. General's Charlotte, NC tire manufacturing plant is back in operation after a four month strike idled the facility. The new three-year contract's basic provisions are similar to labor agreements negotiated in the past 16 months at General's Waco, TX and Mayfield, KY tire plants.

Production of lead-free zinc oxide increased in October over September to 12,173 metric tons but shipments were down 15%.

A 3-4% increase in the number of U.S. cars and light trucks in 1984, the biggest jump in a decade, will help boost U.S. retail sales of replacement belts and hose to a record $900 million this year according to Goodyear. The growth represents an 8% increase over 1983's mark of $828 million. Unit sales of v-belts and hose will climb about 4-5% this year.

**IISRP Western Europe new rubber consumption forecast (all figures in thousand metric tons)**

| | 1982 | 1983 | 1984 | 1988 |
|---|---|---|---|---|
| Styrene butadiene—dry | 577 | 583 | 588 | 613 |
| Styrene butadiene—latex | 105 | 106 | 108 | 115 |
| Polybutadiene | 210 | 218 | 222 | 235 |
| Ethylene-propylene | 121 | 125 | 127 | 144 |
| Polychloroprene | 82 | 80 | 79 | 76 |
| Nitrile—solid | 59 | 59 | 60 | 64 |
| other synthetic* | 211 | 210 | 212 | 223 |
| total synthetic | 1,377 | 1,393 | 1,409 | 1,483 |
| Natural rubber | 806 | 826 | 835 | 865 |
| total new rubber | 2,183 | 2,219 | 2,244 | 2,348 |
| % synthetic | 63.1 | 62.8 | 62.8 | 63.2 |
| Carboxylated SBR latex | 235 | 248 | 253 | 265 |

*Includes Butyl Rubber and Polyisoprene

The Chemical Manufacturers Association, in its annual economic survey, said industry sales rose 9.6% during 1983 over the year before, to $189 billion, and expects good things for 1984. Sales during 1984 are expected to rise 13% over 1983. Other items from the survey show that capacity utilization should be around 78% in 1984; average operating rate improved to 73% in 1983 from 69% in 1982; there was a 10.8% increase in research and development in 1983; capital expenditures are expected to be increased 10% during 1984 with only 26% of this increase expected to go for new facilities; Exports were $19.8 billion during 1983 nearly equal to 1982; imports rose almost 9% to a projected $10.3 billion and consequently the industry's trade balance slipped 9.4%, the third decline in as many years.


If you're into rubber covered rollers you should know about CATAPOL®

- Reliable results
- Wide hardness range (Soft to hard)
- Safe to use
- Proven performance
- Excellent solvent resistance

Call Toll Free 800-762-7620
5141 Firestone Place
South Gate, CA 90280
213/567-1378 • TWX 910/321-4156

arnco
Making Polyurethanes Simple

Circle 36 on card

Newbern Custom Mix

People.

People are one of the big differences at Newbern Rubber, Inc., Newbern, Tennessee, a new, reliable source for quality custom mix.

People like Tom Dowdle, Newbern Rubber Sales Manager, who makes sure that we use our new state-of-the-art mixing equipment and bulk handling system to fullest advantage, insuring quick turn around on important custom mix orders like yours.

Give us a call, we'll give you a quote.
**Phone (901) 627-2531**

Newbern
Hwy 77 East • P.O. Box 277 • Newbern, Tenn. 38059
Subsidiary of Cadillac Rubber and Plastics, Inc.

Circle 37 on card

## RW survey shows

# Custom mixers optimistic about 1984

*By David Given, Technical Editor*

There is a mood of optimism when custom mixers talk about 1984. The overriding feeling is that this year will see a definite increase in the volume of rubber mixed by someone other than the fabricator.

Conversations with most of the custom mixers in the U.S. bear out this feeling. "We plan to mix more in '84 than we did in '83 . . . A lot more companies are going out and leaving the responsibility to somebody else for their mixing and prepping . . . I think what we're seeing is an increase in companies going out, even the big companies . . They're all seeming to go outside and have somebody else mix their stock," said William O. Stoufer of the Bearfoot Airway Division, Wadsworth, OH.

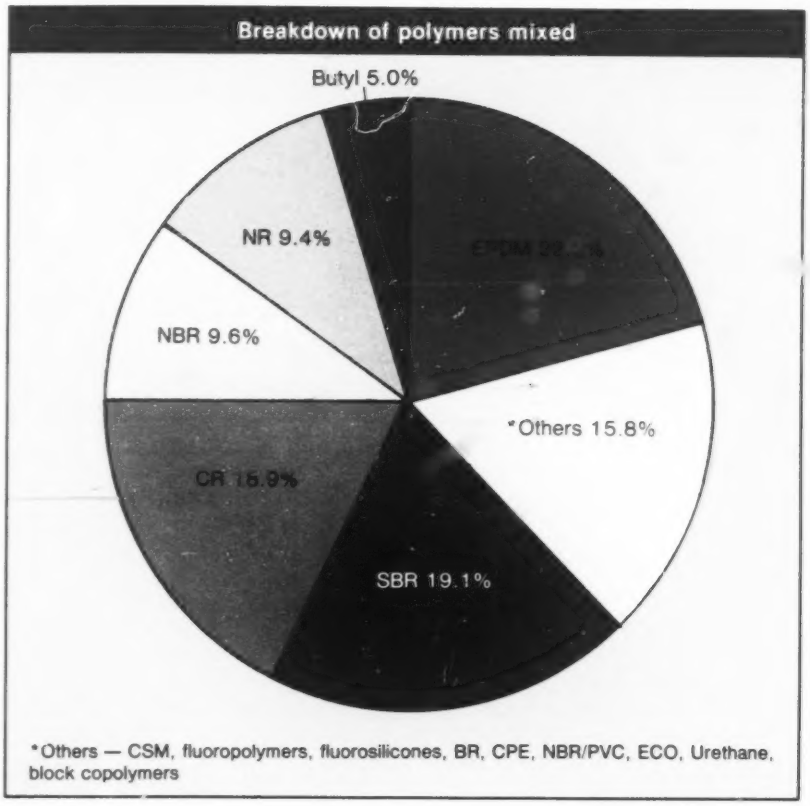
This optimistic mood is further borne out by a recent RW survey of custom mixers. Even with the economic slowdown experienced in the last few years, about 33% of the custom mixers in the U.S. had plant expansions in 1983, while nearly 41% plan to expand their plant capacity in 1984. One of those planning to expand, Bill Randall of Beebe Rubber Co., Nashua, NH, had this to say, "We are looking for even more this year, in fact, we are planning on 1984 being our best year in about six."

Another indication that the custom mixing industry is on the upswing is found in the responses to questions about capacity and volume. The estimated capacity of the industry is approximately 1.378 billion lbs/year. According to RW's estimates, the volume in pounds mixed in 1982 was approximately 860 million pounds, about 62.4% of the estimated capacity. In 1983 the estimated volume was 1.01 billion pounds, 73.3% of the estimated capacity reflecting a 17.4% increase in volume over 1982. This underuse of the available capacity coupled with the fact that over one-third of the custom mixers are planning to expand is a good indication that 1984 will be a good one for the custom mixing industry.

A breakdown of the polymers mixed by custom mixers on a percentage basis reflects the growth of ethylene propylene rubbers in the single ply roofing market, wire and cable insulation and jacketing, hose, seals and gaskets. EPDM led the list with 22.2% of the total. This amounted to about 224 million pounds in 1983. The next most frequently mixed polymer was the general purpose workhorse, SBR, with approximately 19.1% of the total, or 192.9 million pounds. Chloroprene (CR) was third with 18.9% or about 191 million pounds. The amount of nitrile rubber (NBR) mixed was 97 million pounds or about 9.6% of the total. Natural rubber (NR) amounted to 95 million pounds in 1983, or about 9.4% of the total. The remaining 159.6 million pounds that were mixed in 1983 were categorized as others and amounted to 15.8% of the total. Others included some of the more exotic polymers such as fluoroelastomers, silicones, fluorosilicones, epichlorohydrin (ECO), and chlorosulfonated polyethylene (CSM). Other better known polymers that were mixed in small quantities included butadiene rubber (BR), chlorinated polyethylene (CPE), urethanes, block copolymers and nitrile/polyvinyl chloride (NBR/PVC).

> ***"We are looking for even more this year, in fact, we are planning on 1984 being our best year in about six years."***
>
> **Beebe's Randall**

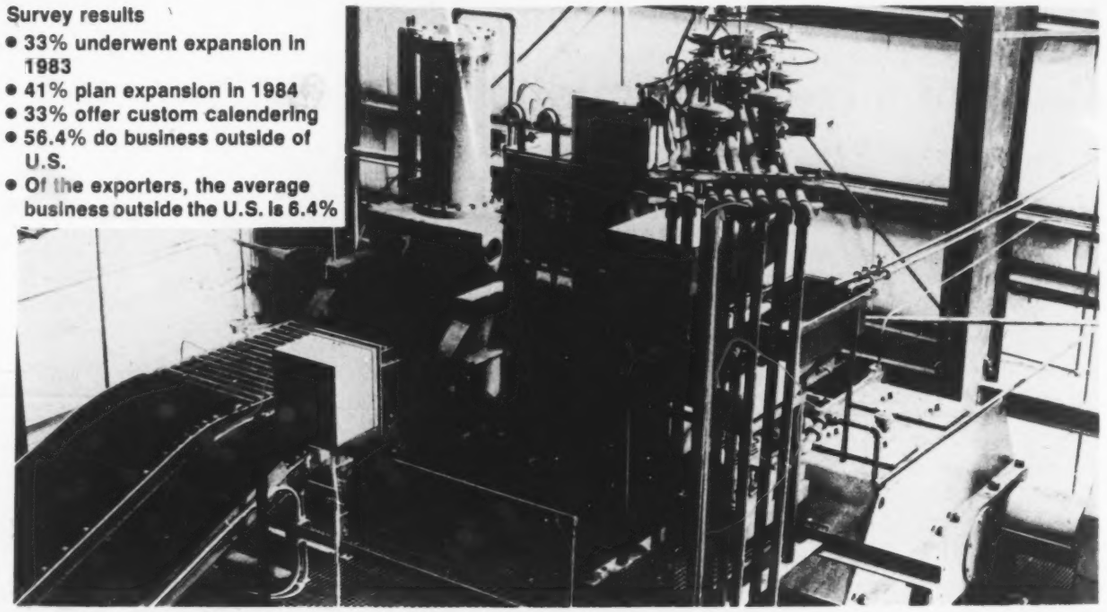
A growing segment of the industry is the silicone, fluorosilicone, and fluoroelastomer mixer. These polymers are relatively expensive and are generally difficult to mix. Many custom mixers will not usually mix them because of these factors and the small amounts that a fabricator may require at any one time. One of the major custom mixers said, "We are a little leery of some of the fluoroelastomers . . . we mix only at the customer's responsibility, he has to have someone here." There are three custom mixers that mix silicone exclusively. They are: Depco Inc., Brentwood, NY; J-Sil Division of Jamak, Weatherford, TX; and Laur Silicone




*Others — CSM, fluoropolymers, fluorosilicones, BR, CPE, NBR/PVC, ECO, Urethane, block copolymers

**Survey results**

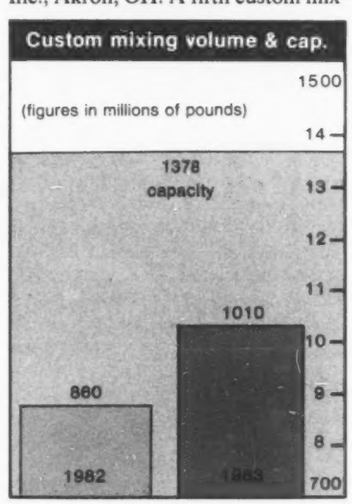
- **33% underwent expansion in 1983**
- **41% plan expansion in 1984**
- **33% offer custom calendering**
- **56.4% do business outside of U.S.**
- **Of the exporters, the average business outside the U.S. is 6.4%**



Rubber Compounding, Inc., Beaverton, MI. Two others mix only fluoroelastomers and fluorosilicones. They are: ChemRite, Inc., W. Hanover, MA and Eagle Elastomer, Stow, OH. Neil McHale of Eagle Elastomer told us, "We mix, calender, and extrude fluoroelastomers and other specialty elastomers requiring special processing or handling techniques. Although we calender and extrude various specialty polymers, our custom mixing operation is mainly set up for mixing fluoroelastomers. Our normal batch size is only 60 pounds which gives us good control and consistent uniformity when handling these difficult polymers."

Thirteen or 33.3% said that they also did custom calendering. According to E.D. Gordon of Rubber Mixing Industries of Wooster, OH, "about 90% of the material that we mix goes to the calender." L.G. Parasson of Master Processing Corporation, Long Beach, CA said "we do most all types of calendering: calendering fabric, frictioning, skimming fabric. We manufacture a line of tank lining compounds, and we specialize in roll covers."

More than half, 56.4% of the custom mixers, said that they did some exporting. Most of these did less than 5% of their business in foreign countries. One mixer cited the lower cost of labor in some of the countries for his lack of foreign business. Only four mixers did an appreciable amount of export business. They are: Adcoat Inc., Placentia, CA; Graphic Arts Rubber, Inc., Akron, OH; Lloyd Manufacturing Company, Inc., Warren, RI; and Rainbow Mastermixing Inc., Akron, OH. A fifth custom mixer with a sizable portion of its business overseas is the J-Sil Division of Jamak in Weatherford, TX. J-Sil has a manufacturing unit in Manchester, England. S.F. "Shorty" Long, president of J-Sil told RW that they were looking for a silicone gum source in 1978 and ended up with a silicone custom mixing plant. In talks with ICI J-Sil learned that ICI wanted to get out of the custom mixing business. This desire gave J-Sil the opportunity to become the only international custom mixer in the industry.




They acquired ICI's custom mixing business, technology, key people and customers with the stipulation that they follow ICI's practices to the letter. J-Sil did not lose a single customer in the transfer and has been very successful in the United Kingdom. They presently have 35 to 40% of the silicone business in the U.K. About 85% of their total business is in the U.K. with 15% in Europe. Serving the automotive, appliances, medical and general electrical markets. At this time no one has followed J-Sil's lead in establishing foreign manufacturing capability. The outlook is excellent for both their U.K. business and their domestic business as well.

## Custom mixers

*The following directory lists the custom mixers along with plant locations, equipment, mixing capabilities and capacity. A map showing locations appears on pages 22 and 23.*

Hugh Muller
President
Sheldon Weinstein
Vice President
**Adcoat Inc.**
172 E. La Jolla St.
Placentia, CA 92670
(714) 630-7311
**Equipment:** 5 high speed dispersion mixers, 10 low speed mixers
**Mixing capabilities:** all solvent soluble resins and polymers
**Capacity:** 12 million lbs/year

S. Pahuja
Gen. Mgr.
**Alloy Polymers, an Inco Co.**
145 Hopper Ave.
Waldwick, NJ 07463
(201) 447-6172
**Branch**
Alloy Polymers
3155 W. Big Beaver Road
(Suite 205)
Troy, MI 48084
(313) 626-5162
**Equipment:** 2 lines-Werner & Pfleiderer Twin Screw High Intensity Mixers
**Mixing capabilities:** Specialize in engineering polymers
**Capacity:** 10 million lbs/year

Glenn Stephens
Sales Mgr.
**Associated Rubber Co.**
Spring St.
P.O. Box 245
Tallapoosa, GA 30176
(404) 574-2321
**Equipment:** 3 #11 Banburies
**Mixing capabilities:** SBR, NR, NBR; CR, ECO, CSM, EPDM, IIR, CIIR, Fluoroelastomers
**Capacity:** 18 million lbs/year

Anthony Chiulli
Operations Manager
Mark F. Chase
Factory Manager
Frank B. Smith
Sales Manager
**Avon Custom Mixing Services Division Chase & Sons Inc.**
55 High St.
Holbrook, MA 02343
(617) 767-0511

**Equipment:** 2 #11 Banburies, #3 Banbury, 8 mills (84", 60", 48"), 6 calenders
**Mixing capabilities:** all elastomers including silicone
**Capacity:** 10 millions lbs/year

W.O. Stoufer
General Sales Mgr.
**Bearfoot Airway Division**
**Bearfoot Corp.**
First & Water Sts.
Wadsworth, OH 44281
(216) 335-2581
**District Sales Office**
Bob Kross
404 Northland Towers W.
15565 Northland Dr.
Southland, MI 48075
**Equipment:** 3 #11 Banburies (1 pelletizer), 3 calenders, 4-84" mills, 3-60" mills, 2 tubers, Cameron 56" slitter
**Mixing capabilities:** SBR, NBR, CR, BR, IIR, NR, Non-black, Adhesives, specialize in butyl mixing
**Capacity:** 20 to 25 million lbs/year

Bill Randall
Technical Director
**Beebe Rubber Co.**
20 Marshall St.
Nashua, NH 03061
(603) 883-5576
**Equipment:** #3A Banbury, 2 #11 Banburies, 5 mills (60 to 84")
**Mixing capabilities:** NR, CR, IIR, SBR, NBR, CSM, Polysulfide, all others except silicone
**Capacity:** 90 million lbs/year

David W. Mohr
VP Sales
**Burton Rubber Processing Inc.**
14330 Kinsman Rd.
Burton, OH 44201
(216) 834-4644
**Branch**
P.O. Box 377
Highway 34
Jonesboro, TN 37659
**Equipment:** 2 #11D Banburies, F270 Banbury, F370 Banbury, 4-60" mills
**Mixing capabilities:** all synthetic and natural rubber excluding latex, silicones and fluoroelastomers, alloys of plastics/rubber and color concentrates, PVC/NBR blends
**Capacity:** 50 to 80 million lbs/year

Dick Mastromatteo
Owner
Ernest Morrisey
General Manager
**ChemRite, Inc.**
P.O. Box 1052
149 King St.
W. Hanover, MA 02339
(617) 878-5300
**Equipment:** 2 #3A Banburies, 3-60" mills, 84" mill, 8½" extruder/strainer, 3 refiners
**Mixing capabilities:** fluoropolymers and fluorosilicones
**Capacity:** 2 million lbs/year

Jim Carver
VP Sales
**Colonial Rubber Works**
150 South Connell Ave.
Dyersburg, TN 38024
(901) 285-4353
**Branch**
P.O. Box 640
Kingstree, SC 29556
**Equipment:** 2 #27 Banburies, 3 #12 Stewart Bolling, 6 #10 Stewart Bolling, 4 calenders (3-60", 1-66")
**Mixing capabilities:** all except fluoroelastomers
**Capacity:** 250 million lbs/year

Doug Brown
Gen. Mgr.
**Container Corporation of America Heisler Compounding Division**
P.O. Box 1648
1204 E. 12th Street
Wilmington, DE 19898
(302) 573-2550
**Equipment:** 2 #4 Stewart Bolling, #10 Stewart Bolling, 6" cold feed extruder with each mixer
**Mixing capabilities:** Plastic resins, IIR, EPDM, EPR, NBR, SBR, general polyolefins, non-black
**Capacity:** 70 million lbs/year

David Bean
President
**Depco Inc.**
36 Grand Blvd.
Brentwood, NY 11717
(516) 231-1610
**Equipment:** 2 mills (40" and 45")
**Mixing capabilities:** exclusively silicone
**Capacity:** One million lbs/year

Neil McHale
Director of Sales
**Eagle Elastomer**
4646 Darrow Rd.
Stow, OH 44224
(216) 688-7070
**Equipment:** 36" special mill, 60" calender, 2½" extruder
**Mixing capabilities:** fluoroelastomers and fluorosilicones
**Capacity:** 1.25 million lbs/year

L. Raymond Olson
President
**Gayson Inc.**
P.O. Box 222
Ringwood, NJ 07456
(201) 728-8100
**Equipment:** Banbury, 2 2-roll mills, 3 3-roll mills
**Mixing capabilities:** silicone, specialty colors
**Capacity:** not available.

Fred Williams
President
**Global Processing Co.**
11831 Wakeman St.
Santa Fe Springs, CA 90670
(213) 945-1241
**Equipment:** #4 Banbury, 2 mills (60" & 50")
**Mixing capabilities:** All types except silicone, specialize in fluoroelastomers
**Capacity:** 5 million pounds/year.

Jim Bedell
Sales Manager
**Graphic Arts Rubber, Inc.**
467 Dan Street
Akron, OH 44310
(216) 253-0731
**Equipment:** 3-60" mills
**Mixing capabilities:** all-no free black
**Capacity:** Two million lbs/year

Jack Williams
VP & Gen. Mgr.
**Hoover-Hanes**
Pequanoc Dr.
Tallapoosa, GA 30176
(404) 574-2341
**Equipment:** #11 Banbury, #9 Banbury, 84" mill, 100" mill
**Mixing capabilities:** all grades of soft and hard rubber
**Capacity:** 30 million lbs/year

S.F. Long
President
**J-Sil**
**Division of Jamak**
1400 North Bowie Drive
Weatherford, TX 76086
(817) 594-0263

**Branch**
J-Sil East
169 Progress Dr.
Manchester, CT 06040
(203) 761-5509
J-Sil Midwest
County Roads 100 E and 800 N
Brimfield, IN 46720
(219) 761-3271

**Equipment:** #9A Banbury, 4-300 gal Z-Blade mixers, 100 gal Z-blade mixer, 20 gal Z-blade mixer, 12 mills (20 to 84"), 3-8" extruders, 4-5" extruders, 3 Barwells
**Mixing capabilities:** exclusively silicone
**Capacity:** 12 million lbs/year

Victor E. Nunan
VP & Gen. Mgr.
**J-Von**
**Division of Jones & Vining**
25 Litchfield St.
Leominister, MA 01453
(617) 537-4721
**Equipment:** 2½" single screw extruder, 4½" single screw extruder, 67mm twin screw extruder, 110mm twin screw extruder
**Mixing capabilities:** styrenic block copolymers, thermoplastic elastomers
**Capacity:** 12 million lbs/year

Dan Laur—VP
**Laur Silicone Rubber Compounding, Inc.**
4930 S. M-18
P.O. Box 509
Beaverton, MI 48612
(517) 435-7706
**Equipment:** 24" mill, 60" mill, 10 gal & 150 gal double arm mixers, preforming strainers
**Mixing capabilities:** exclusively silicone
**Capacity:** One million lbs/year

Harry Moorachian
Sales Manager
**Lloyd Manufacturing Company, Inc.**
**A Subsidiary of TransTechnology Corporation**
P.O. Box 347
130 Franklin Street
Warren, RI 02885
(800) 556-9326
In RI (401) 245-6603
**Equipment:** 4 roll Z calender, #3A Banbury, 100" mill, 5-60" mills
**Mixing capabilities:** Principally calendering
**Capacity:** 5 to 6 million lbs/year

R. Joe Dunnam
Director Custom Mixing
**Long Mile Rubber — Flexmix Div.**
P.O. Box 45228
Dallas, TX 75245
(214) 350-7851
**Equipment:** #4 Banbury + 6" extruder, #9 Banbury, 2 #11 Banburies, 2-260A Skinners, 60" mill, 3-8" hot-feed extruders, 2-10" extruders
**Capacity:** Not available.

Edward M. Echan
General Manager
**Mach-1 Compounding**
**Division of Burton Rubber Processing Inc.**
775 E. Highland Rd.
Macedonia, OH 44056
(216) 467-8109
**Equipment:** #3D Banbury, Henschel, ribbon blender
**Mixing capabilities:** thermoplastic, thermoset, thermoplastic elastomer, alloys
**Capacity:** 12 million lbs/year

L.G. Parasson
Sales & Marketing
**Master Processing Corp.**
2500 Thompson St.
P.O. Box 740
Long Beach, CA 90801
(213) 531-3880

**Branch**
Muscatine, IA
(319) 262-2505
**Equipment:** #11 Banbury, 3 #12 Stewart Bolling, #10 Stewart Bolling, 3-66" calenders, 60" calender, 7 mills (60", 66", 84")
**Mixing capabilities:** all of the solids
**Capacity:** 195 million lbs/year

Harold Jessop
General Manager
**Midwest Rubber Reclaiming Co.**
745 Norton Ave.
P.O. Box 270
Barberton, OH 44203
(216) 753-5056
**Equipment:** #11 Banbury, Shaw K-7, #12 Stewart Bolling
**Mixing capabilities:** all polymers
**Capacity:** 60 million lbs/year

H.L. Gaynor
VP
**H. Muehlstein & Co., Inc.**
3296 W. Market St.
P.O. Box 5402
Akron, OH 44313
(216) 836-9131
**Equipment:** #27 Banbury
**Mixing capabilities:** complete master-batch mixing services
**Capacity:** 12 million lbs/year

Dale Meyering
Customer Service Mgr.
**Newbern Rubber, Inc.**
P.O. Box 277
Hwy 77 East
Newbern, TN 38059
(901) 627-2531
**Equipment:** F270 Banbury
**Mixing capabilities:** NR, EPDM, SBR, NBR, CR, CSM, ECO, BR
**Capacity:** 30 million lbs/year

W.H. Phillips
Treasurer
**Paeco Rubber Co.**
225 W. Lake St.
P.O. Box 472
(216) 673-4100
**Equipment:** #10 Stewart Bolling
**Mixing capabilities:** all except Viton or silicone
**Capacity:** 18 to 20 million lbs/year

John Mathey
**Passaic Rubber Co.**
45 Demerest Dr.
P.O. Box 505
Wayne, NJ 07450
(201) 696-9500
**Equipment:** #4 Stewart Bolling, 5 mills (60" to 84"), 2-54" cal-

enders, 4″ extruder
**Mixing capabilities:** all polymers except polysulfide
**Capacity:** 3 million lbs/year

Bruce G. Pelham
VP Sales
**Pelmor Laboratories Inc.**
401 Lafayette St.
P.O. Box 309
Newtown, PA 18940
(215) 968-3334
**Equipment:** #1A Banbury, 3 mills (18″, 40″, 60″)
**Mixing capabilities:** generally all types, specializing in Viton
**Capacity:** One million lbs/year

Arthur P. Reis
Gen. Mgr.
**Pilgrim Custom Mixing Corp.**
84 Water St.
P.O. Box 2573
Fall River, MA 02722
(617) 675-0181
**Equipment:** 3 #11 Banburies, 2-60″ mills, 3-84″ mills
**Mixing capabilities:** all general purpose polymers
**Capacity:** 13 million lbs/year

Dave Topliff
Production Mgr.
**Polymerics, Inc.**
2828 Second St.
Cuyahoga Falls, OH 44221
(216) 928-2210
**Equipment:** #9 Banbury, 60″ mill, 84″ mill
**Capacity:** 12 million lbs/year

T.C. Green
Corporate Offices General Manager
R.W. Houkom
Marketing Manager
**Polysar Rubber Services Division of Polysar Inc.**
2603 W. Market St.
Akron, OH 44313
(216) 836-0451
**Regional Plant Locations:**
Joe Falanga
Site Manager
1020 Lambert St.
Barberton, OH 44203
(216) 745-1184
Eric Haddon
Site Manager
Colonial Oaks Ind. Park
P.O. Box 327
East Brunswick, NJ 08816
(201) 257-9600
Charles McKeag
Site Manager
1038 Evans Ave.
Akron, OH 44305
(216) 630-9460
**Equipment:** 2 #4 Banburies, 2 #11 Banburies, #12 Banbury, 2 F270 Banburies
**Mixing capabilities:** most organic rubbers and thermoplastics, silicone, separate black and non-black facilities
**Capacity:** approx. 100 million lbs/year

James Inga
President
**R&S Processing Co., Inc.**
15712 Illinois Ave.
P.O. Box 985
Paramount, CA 90723
(213) 531-1403
**Equipment:** #9 Banbury (black), #4 Stewart Bolling (colors)
**Mixing capabilities:** NR, IR, SBR, IIR, EPDM, ECO, CR, Urethane, Polysulfide, Viton, NBR
**Capacity:** 12 million lbs/year

Daniel R. Unk
President
**Rainbow Mastermixing Inc.**
455 Dan St.
Akron, OH 44310
(216) 374-1810
**Equipment:** 60″ rubber mills, granulators
**Mixing capabilities:** All. Specializing in colors and fluoroelastomers
**Capacity:** 1.5 million pounds

Joe Rauh
President
**Rauh Rubber Inc.**
986 E. Market St.
Akron, OH 44305
(216) 253-2549
(216) 253-5667
**Equipment:** #11 Banbury, 60″ mill, 84″ mill, Barwell extruder/preformer
**Mixing capabilities:** NR, SBR, EPDM, NBR, CR, EPR, IIR, ECO
**Capacity:** 20 million lbs/year

E. David Gordon
**Rubber Mixing Industries**
1205 E. Bowman St.
Wooster, OH 44691
(216) 264-4091
**Equipment:** #3A Banbury, #11 Banbury, 68″ 3-roll calender, 66″ 3-roll calender, 66″ 4-roll offset calender
**Mixing capabilities:** NBR, SBR, EPDM, CSM, CR, IIR, custom calendering
**Capacity:** 20 million lbs/year

**1-Adcoat Inc.**
**2-Alloy Polymers**
**3-Associated Rubber**
**4-Avon Custom Mixing**
**5-Bearfoot Airway**
**6-Beebe Rubber**
**7-Burton Rubber Processing**
**8-ChemRite, Inc.**
**9-Colonial Rubber Works**
**10-Container Corporation of America**
**11-Depco Inc.**
**12-Eagle Elastomer**
**12a-Gayson, Inc.**
**12b-Global Processing**
**13-Graphic Arts Rubber**
**14-Hoover-Hanes**
**15-J-Sil**
**16-J-Von**
**17-Laur Silicone Rubber Compounding**
**18-Lloyd Manufacturing Company**
**19-Long Mile Rubber**
**20-Mach-1 Compounding**

John P. Davis
**S&D Rubber Co.**
King Street
W. Hanover, MA 02339
(617) 878-2626
**Equipment:** #3A Banbury, 3 #9 Banburies, 2 extruders (4″ & 8″), 2 mills (60″ & 84″)
**Mixing capabilities:** all polymers
**Capacity:** 20 million lbs/year

Marty Sheridan
General Manager
**Star-Glo Industries**

2 Carlton Ave.
East Rutherford, NJ 07073
(201) 939-6162
**Equipment:** 2 #3A Banburies, 2-66" calenders
**Mixing capabilities:** NR, SBR, CIS-BR, NBR, CR, IIR, EPDM, CSM, ACM, Urethane, Norsorex, Fluoroelastomers, silicone
**Capacity:** 3 million lbs/year

Marc Witt
Vice President
**Technical Rubber & Plastics Corp.**
180 Getty Ave.
Clifton, NJ 07015
(201) 546-0700
**Equipment:** #3A Banbury
**Mixing capabilities:** SBR, NR, EPDM, CSM, CR, Viton, Silicone, Urethane, Polysulfide
**Capacity:** 20 million lbs/year

Bill Bryant
VP Sales
**Valley Processing**
491 Wilson Way
Industry, CA 91744
(213) 961-0311
**Equipment:** #3A Banbury, 2 #11 Banburies, 68" 4-roll calender
**Mixing capabilities:** SBR, CR, NBR, EPDM, IIR, NR, CSM, BR
**Capacity:** 38 million lbs/year

Arun Shah
Vice President R&D
**West American Rubber Co.**
750 North Main St.
Orange, CA 92668
(714) 532-3355
**Equipment:** #3A & #11 Banburies
**Mixing capabilities:** all solid polymers
**Capacity:** 25 to 30 million lbs/year

# Rubber World

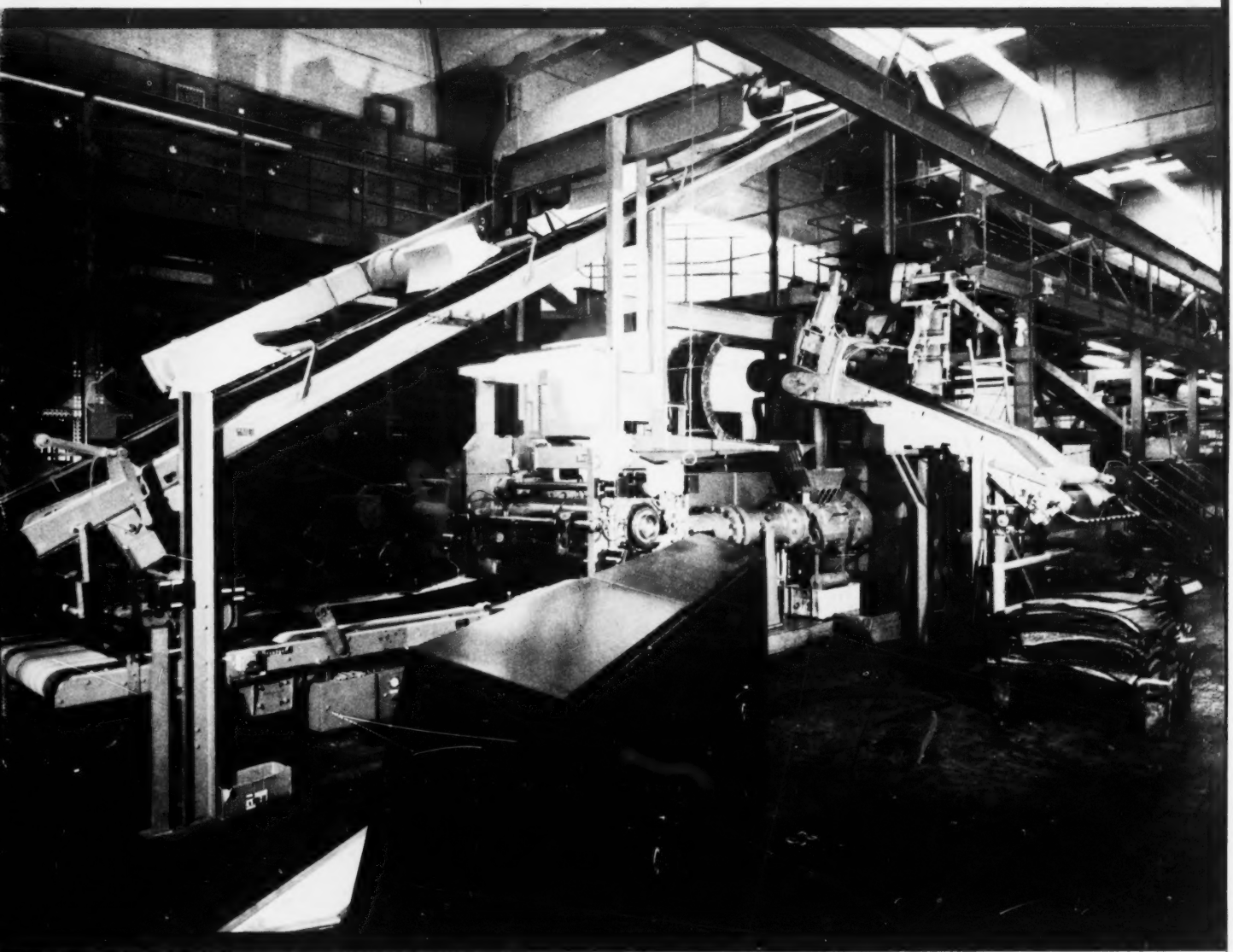
The technical service magazine for the rubber industry

Volume 189, No. 6

March 1984


C5175

## Roller head plant for innerliners



## Neoprene blends for high performance innerliners

## A new fluoroelastomer

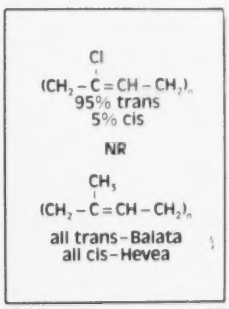
## Compounding ingredients price list

# Rubber World

**The technical service magazine for the rubber industry**

Roller head plant for innerliners p. 20

Neoprene blends for tire innerliners p. 30




Price list p. 57


**10 Business Briefs**
acquisitions, expansions; contracts, licenses; financial statements; markets and news

**14 Tech Service — Stopping the action**
by Jon Menough, contributing technical service editor. Advances in videotaping are enabling testers to view high speed action giving a different perspective for some tests.

**20 Roller head plant for innerliners**
by Gerd Capelle, Herman Berstorff, Maschinenbau GmbH, Hanover, West Germany. Author describes the equipment and process for setting up a roller head plant for the manufacture of tire innerliners.

**30 High performance innerliners through the use of neoprene blends**
by H.J. Barager, Du Pont Co. Article looks at neoprene blends with chlorobutyl and epichlorohydrin or both for improving tire innerliners.

**38 A new fluoroelastomer with outstanding chemical resistance and improved low temperature properties**
by G. Kojima, M. Yamabe, H. Wachi and S. Kodama, Asahi Glass Co. This new fluoroelastomer, which has been developed by copolymerizing the purposely designed fluoromonomers, is described.

**44 New Patents**
edited by Bob Samples, Akron Rubber Development

**45 Meetings**
PMA spring meeting, IFAI conferences, FRCA spring meeting, Rubber group news, calendar of coming events.

**54 Techno Mart**
edited by David Given, technical editor. New developments in computer aided chemistry, design, manufacturing and technology.

**57 Compounding Ingredients Price List**
A semi-annual listing of current prices for rubber compounding ingredients.


## Departments


6 Editorial
8 Mailbag
71 Jobs & People
72 New Literature


## Cover

**Cover courtesy of Herman Berstorff Maschinenbau, West Germany.**


A Lippincott & Peto Publication/ Volume 189, No. 6/March 1984

**RMA monthly tire & tube shipments & production report through October 1983 (figures in thousands of units)**

| Passenger Tires | 1983 | 1982 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 35,694 | 28,472 | +25.37 |
| Radial | 29,793 | 23,805 | +25.15 |
| Replacement | 115,112 | 112,033 | +2.75 |
| Radial | 79,895 | 73,084 | +9.32 |
| Export | 3,358 | 2,367 | +41.87 |
| Radial | 2,294 | 1,275 | +79.92 |
| Total | 154,164 | 142,872 | +7.90 |
| Radial | 111,982 | 98,164 | +14.08 |
| Production | 130,888 | 126,673 | +3.33 |
| Radial | 91,415 | 86,385 | +5.82 |
| Ending Inventory | 26,150 | 31,456 | −16.87 |
| Radial | 19,350 | 23,854 | −18.88 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 4,437 | 3,991 | +11.18 |
| Radial | 2,055 | 1,583 | +29.82 |
| Replacement | 25,216 | 23,712 | +6.34 |
| Radial | 8,372 | 6,915 | +21.07 |
| Export | 855 | 815 | +4.91 |
| Radial | 407 | 233 | +74.68 |
| Total | 30,508 | 28,518 | +6.98 |
| Radial | 10,834 | 8,731 | +24.09 |
| Production | 25,416 | 24,270 | +4.72 |
| Radial | 7,851 | 6,307 | +24.48 |
| Ending Inventory | 5,380 | 6,660 | −19.22 |
| Radial | 2,024 | 2,552 | −20.69 |

technical service and will utilize the facilities of Akron Rubber Development Laboratory for customer compound evaluation.

**AMF Tire Equipment Division** will distribute **Cincinnati Retread Systems'** products in the U.S. CRS designs and manufactures buffing equipment for the retread industry.

**Rogers Corp.** has entered a joint venture with **Inoue MTP Co. Ltd.** of Japan to manufacture and sell polymer products in the Far East. Inoue, initially, will manufacture Rogers cellular and microcellular urethanes.

**Hydralign Inc.** appointed **Technical Sales** of Brick Township, NJ manufacturers sales representative for New York City, Long Island and northern New Jersey and **Engineering Sales Co.**, Nashville, TN to cover the states of AL, AK, KY, MS and TN for Hydralign's web guiding systems and web handling accessories.

**Montgomery Ward & Co.** will sell **Bridgestone Tire** passenger tires in 525 retail and catalog outlets under an agreement reached by the two companies.

**W.R. Smith and Company**, Twinsburg, OH will distribute the **Continental Products Corp.'s** offset printing blanket line in the U.S.

## Financial statements

**Armstrong** reported record first quarter earnings of $6.2 million on record sales of $162.8 million.

**Asarco** reported net earnings of $58.3 million on sales of $1.512 billion for 1983.

**Cabot Corp.** had a net income of $17.5 million for its first quarter with net sales of $399.9 million.

**Carlisle Corp.** had 1983 earnings of $22.6 million on sales of $411.8 million.

**Compo Industries** announced first quarter revenues were $24.2 million and net income was $3.9 million.

**Eagle-Picher** reported 1983 net income was $15.3 million on sales of $532.7 million.

**Exxon** estimated net income for 1983 was $4.985 billion with revenues totalling $94.591 billion.

**Freeport/McMoran** reported net income for 1983 was $93.4 million with net income of $65.9 million.

**Gulf Corp.'s** 1983 net income was $978 million and total revenues were $28.9 billion.

**Lydall, Inc.** reported 1983 net income of $1.4 million with net sales of $29.9 million.

**Pfizer Inc.** said net income for 1983 was $447 million on sales of $3.75 billion.

**Rubbermaid Inc.** reported record sales for 1983 of $436 million and record net earnings of $35.7 million.

**Sheller Globe** recorded net sales of $607.9 million with a net income of $16.6 million.

**The Standard Products Co.** reported record second quarter sales of $81 million and net income of $5.3 million.

## Price changes

**Polaroid Corp.** reduced the prices of its Polathane XPE

**RMA industry rubber report through November 1983 (figures are expressed in metric tons)**

| | Cumulative 1983 | Cumulative 1982 | % Change 83 vs 82 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 2,614,956 | 2,419,882 | 8.06 |
| Imports | 799,790 | 704,612 | 13.51 |
| Exports | 283,034 | 294,135 | −3.77 |
| Apparent Consumption | 2,337,489 | 2,213,363 | 5.61 |
| **Total Natural Rubber** | | | |
| Imports | 624,916 | 581,948 | 7.38 |
| Exports | 17,351 | 13,563 | 27.93 |
| Apparent Consumption | 626,706 | 604,600 | 3.66 |
| % Total new rubber | 26.81 | 27.31 | |
| **Total Synthetic Rubber** | | | |
| Production | 1,815,166 | 1,715,270 | 5.82 |
| Imports | 174,874 | 122,664 | 42.56 |
| Exports | 265,683 | 280,572 | −5.31 |
| Apparent Consumption | 1,710,782 | 1,608,762 | 6.34 |
| % Total new rubber | 73.18 | 72.68 | |
| **Total SBR** | | | |
| Production | 831,756 | 809,905 | 2.70 |
| Imports | 58,256 | 50,448 | 15.48 |
| Exports | 78,990 | 81,646 | −3.25 |
| Apparent Consumption | 814,045 | 791,735 | 2.82 |
| **Total Nitrile** | | | |
| Production | 50,005 | 43,044 | 16.17 |
| Imports | 8,599 | 7,305 | 17.71 |
| Exports | 5,768 | 6,083 | −5.18 |
| Apparent Consumption | 52,764 | 47,100 | 12.03 |
| **Polybutadiene** | | | |
| Production | 302,625 | 271,535 | 11.45 |
| Imports | 44,559 | 27,280 | 63.34 |
| Exports | 15,344 | 13,067 | 17.43 |
| Apparent Consumption | 321,653 | 292,193 | 10.08 |
| **Ethylene-Propylene** | | | |
| Production | 161,089 | 117,844 | 36.70 |
| Imports | 614 | 211 | 191.00 |
| Exports | 27,735 | 25,581 | 8.42 |
| Apparent Consumption | 129,412 | 105,233 | 22.98 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 366,613 | 363,676 | .81 |
| Imports | 56,265 | 36,179 | 55.52 |
| Exports | 100,919 | 111,086 | −9.15 |
| Apparent Consumption | 313,185 | 305,314 | 2.58 |
| **Polychloroprene** | | | |
| Production | 103,078 | 109,267 | −5.66 |
| Imports | 6,581 | 1,241 | 430.30 |
| Exports | 36,927 | 43,109 | −14.34 |
| Consumption | 79,723 | 67,190 | 18.65 |

urethanes for quantities of 225 pounds or more by 28% as the result of improved manufacturing efficiencies.

## Markets, news

Third quarter carbon black production in 1983 was the highest quarter in three years and shipments for the quarter were the best in two years according to a quarterly report from Columbian Chemicals. Third quarter production increased 18% and shipments were up 13% over the same period in 1982. Demand in all grades was up, with N-100 shipments reaching the second highest in history, within 7% of the record fourth quarter of 1972. Year to date production of 826 mmt and shipments of 845 mmt reflect an increase of 5% over 1982.

Plant inventory reduced 10% during the quarter to 78 mmt, a 3½ week supply, varying from three weeks in N-300, N-500 and N-600 to four weeks in N-200, six weeks in N-700 and eight weeks in N-100.

Consumption of dry rubber hydrocarbons totalling 588 thousand metric tons was the strongest in any third quarter since 1979, although it was 0.2% lower than the second quarter. All synthetic polymers were up from 1982, ranging from 4% in SBR to 13% in polybutadiene, 16% in polychloroprene and over 28% in nitrile and EPDM. Natural rubber's 129 mmt represented the weakest in three years. The first nine months consumption was practically unchanged at 1,773 mmt. The synthetic ratio of 78% rose to the highest in any quarter in 10 years and carbon-rubber ratio increased from 46.4 phr a year ago to 49.2 per hundred rubber. SBR black rubber production of 58 mmt was the lowest quarter in three years. Year-to-date output of 184 mmt decreased 15% from the same period in 1982.

**Carbon black industry in the U.S. (metric tons)**

| | | | 1983 9 months | % change '83 vs '82 |
|---|---|---|---|---|
| N-100 | (SAF) | Prod. | 15,120 | +18.0% |
| | | Ship. | 15,081 | +16.5% |
| N-200 | (ISAF) | Prod. | 88,635 | + 9.9% |
| | | Ship. | 91,815 | +11.0% |
| N-300 | (HAF) | Prod. | 360,505 | + 5.1% |
| | | Ship. | 366,125 | + 5.2% |
| N-500 | (FEF) | Prod. | 69,192 | ( 7.9%) |
| | | Ship | 71,072 | (10.7%) |
| N-600 | (GPF) | Prod. | 207,970 | + 2.8% |
| | | Ship. | 213,506 | + 5.5% |
| N-700 | (SAF) | Prod. | 84,673 | +18.2% |
| | | Ship. | 86,968 | +15.2% |
| TOTAL | | Prod. | 826,095 | + 5.2% |
| | | Ship. | 844,567 | + 5.4% |
| Domestic Shipments (Included Above) | | | 829,560 | + 6.3% |
| Domestic Share | | | 98.2% | |

**Firestone** said that the growing demand for Firestone, Dayton and Road King tires would make it impossible for the company to meet demands of its dealers and stores while supplying private brand customers, so it is phasing out its private brand segment of the tire business.

Installation of rubber roofing on commercial and industrial buildings in 1984 will consume more than 550 million square feet of sheet rubber and generate sales of more than $275 million according to **Goodyear.**


# It's a two-way street

Keeping *you* informed means keeping *us* informed. To report to you the latest in rubber industry happenings, the editors of Rubber World rely on many sources of information. One of our most important sources is you, our reader.

We welcome and encourage your input — employe newsletters, meeting reports, equipment releases, letters to the editor, phone calls. Let us know what's happening with your company; what you're thinking. We want to hear from you.

**Rubber World**

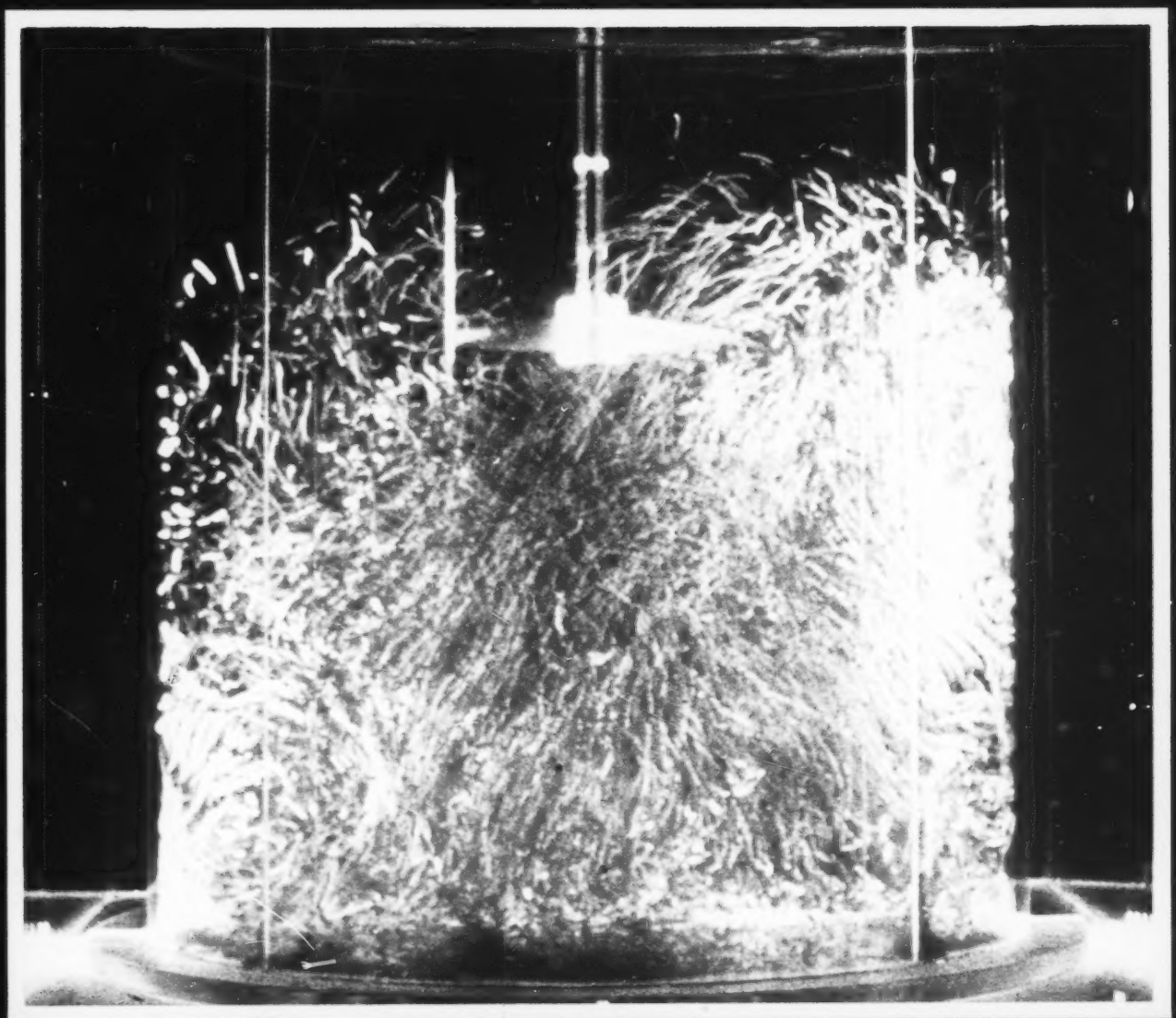
P.O. Box 5485
1867 W. Market St.
Akron, Ohio 44313
(216) 864-2122

4/25/84
C5175-1A

# Rubber World

The technical service magazine for the rubber industry Volume 190. No. 1 April 1984

## The role of fluid flow, shear rates in mixing

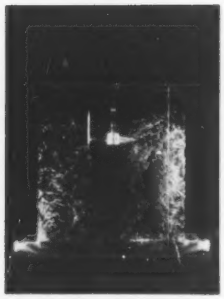


## Textile tire materials adhesion

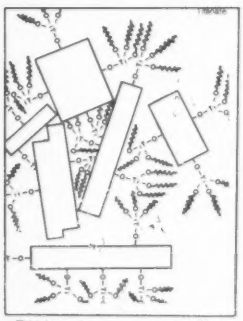
## Titanate coupling agents

# Rubber World

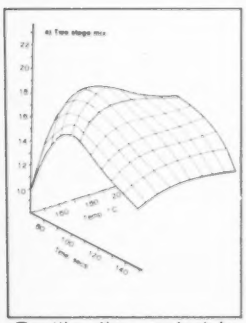
**The technical service magazine for the rubber industry**

Fluid flow, shear rates in mixing p. 14



Titanate coupling agents p. 20



Textile tire materials adhesion p. 36


**9 Business Briefs**

**12 Tech Service — Holding in the heat**
by Jon Menough, contributing technical service editor. A look at platen insulation that is a fiberglass reinforced, mineral filled composite, that can save on energy costs.

**14 The role of fluid flow and fluid shear rates in mixing and dispersion**
by J.Y. Oldshue, Mixing Equipment Co. Author discusses fluid shear stress which carries out mixing and dispersion processes, the way in which non-geometric similarity in impellers used to produce desired ratios of mixing results and their use in scale-up and scale-out techniques, and use of accurate velocity measuring equipment to determine many other fluid mechanics properties.

**20 The use of titanate coupling agents in conductive composites**
by Salvatore J. Monte and Gerald Sugerman, Kenrich Petrochemicals, Inc. Article surveys the state of the art in the use of titanate coupling agents in conductive composites presenting patents, case histories, studies and observations.

**36 The adhesion of textile tire materials**
by D.B. Wootton, Miliken Industries Ltd. Author looks at rubber to textile adhesion in regard to bonding of carcass plies and other textile inserts so that their full reinforcement can be utilized.

**44 Meetings**
IISRP 25th annual meeting schedule; Tire meeting; Adhesion and rheological meetings; Schedule for upcoming Spring ACS Rubber Division meeting.

**52 New Patents**
edited by Bob Samples, Akron Rubber Development

**53 Techno Mart**
edited by David Given, technical editor.


## Departments


4 Editorial
5 Mailbag
60 Jobs & People
62 New Literature


## Cover

**Cover courtesy of Mixing Equipment Co.**


A Lippincott & Peto Publication/ Volume 190, No. 1/April 1984

$21 million on sales of $993 million.

**General Tire's** net income for 1983 was $67.4 million on sales of $2.06 billion.

**BFGoodrich** reported 1983 net income of $18.4 million with sales of $3.2 billion.

**Goodyear** reported worldwide sales in 1983 totaled $9.74 billion and earnings were $305.5 million. The company's fourth quarter earnings of $142 million were the highest of any quarter in history.

**Jones & Vining** reported net earnings in 1983 were $1.9 million on sales of $40.0 million.

**Lubrizol Corp.** had earnings of $800.3 million in 1983 and net income totaled $64.7 million.

**Myers Industries** reported 1983 net sales were $80.6 million and net income was $3.2 million.

**Park-Ohio** posted a net loss for 1983 of $5.5 million. Sales were reported at $142 million.

**Petrolane Inc.** said first quarter net income was $3.5 million on revenues of $267.9 million.

**Brad Ragan, Inc.** recorded a net loss of $68,000 on revenues of $43.5 million for the third quarter.

**Sybron Corp.** reported 1983 earnings of $11.9 million on sales of $554.5 million.

**Uniroyal** reported 1983 net income of $67 million on sales of $2.04 billion.

## Price changes

**Akzo Chemie America's** Noury Chemical group new prices for the following Trigonox products are: 23-C75($3.85/lb); 25-C75($3.35/lb); 21($3.15/lb); 21-C50($2.15/lb); 21-OP50($2.55/lb); F-C50($2.63/lb) B increased 10¢/lb and A-W70 increased 7¢/lb. On May 1, Cadet BPO 70/78 will be increased 17¢/lb and Trigonox C will be increased 21¢/lb.

**Hercules** increased its Dresinate and Resin 731 emulsifiers less than 4%. Prices are: Dresinate 731 is 52.5¢/lb; Dresinate 214 and 515 emulsifier are 56¢; Dresinate 554 is 59¢; Dresinate 979 is $1.26; Resin 731 D is 65¢/lb in bulk while flake 731D is 73¢. Also, Hercolube A increased 5¢/lb and Hercolube 202 is now $1.34/lb.

## Markets, news

A 29% increase in original equipment shipments of passenger tires and a 2.6% increase in replacement tires shipped showed on the Rubber Manufacturers Association year end tire report. Total shipments of tires in 1983 was 182 million, an 8.6% increase over the 167.4 million shipped in 1982. Production increased 4.5% from 149.4 million to 156.2 million. In truck and bus tires there was more than a 9% increase in shipments from 33.7 million to 36.8 million and a 5% increase in production from 29 million to 30.6 million.

The recently released 1982 Census of Manufacturers shows the number of companies in the manufacture of tires and inner tubes is declining while increasing in the fabricated rubber products area. There were 100 companies in the '82 census, down from 121 in 1977 and 136 in 1972. There were 54,800 production workers in 1982 compared to 88,300 in 1977 and 83,100 in 1972. Cost of materials dropped since the 1977 census from $4.8 billion to $4.6 billion. The number of fabricated rubber products companies reached 1,170 in 1982, up from 1,127 in 1977. There were 965 companies reported in the 1972 census. The number of employees is decreasing in this area from 98,500 in 1977 to 87,100 in 1982.

The rubber industry consumed $20 million worth of chemically modified minerals in 1983 according to Charles H. Kline & Co. Treated kaolin as a partial replacement for expensive carbon black, surface modified kaolin and stearate coated calcium carbonate are increasing in usage. These areas have markets of $1 million or more per year. Modified bentonite has over a $1 million year market in adhesives and sealants markets the report stated.

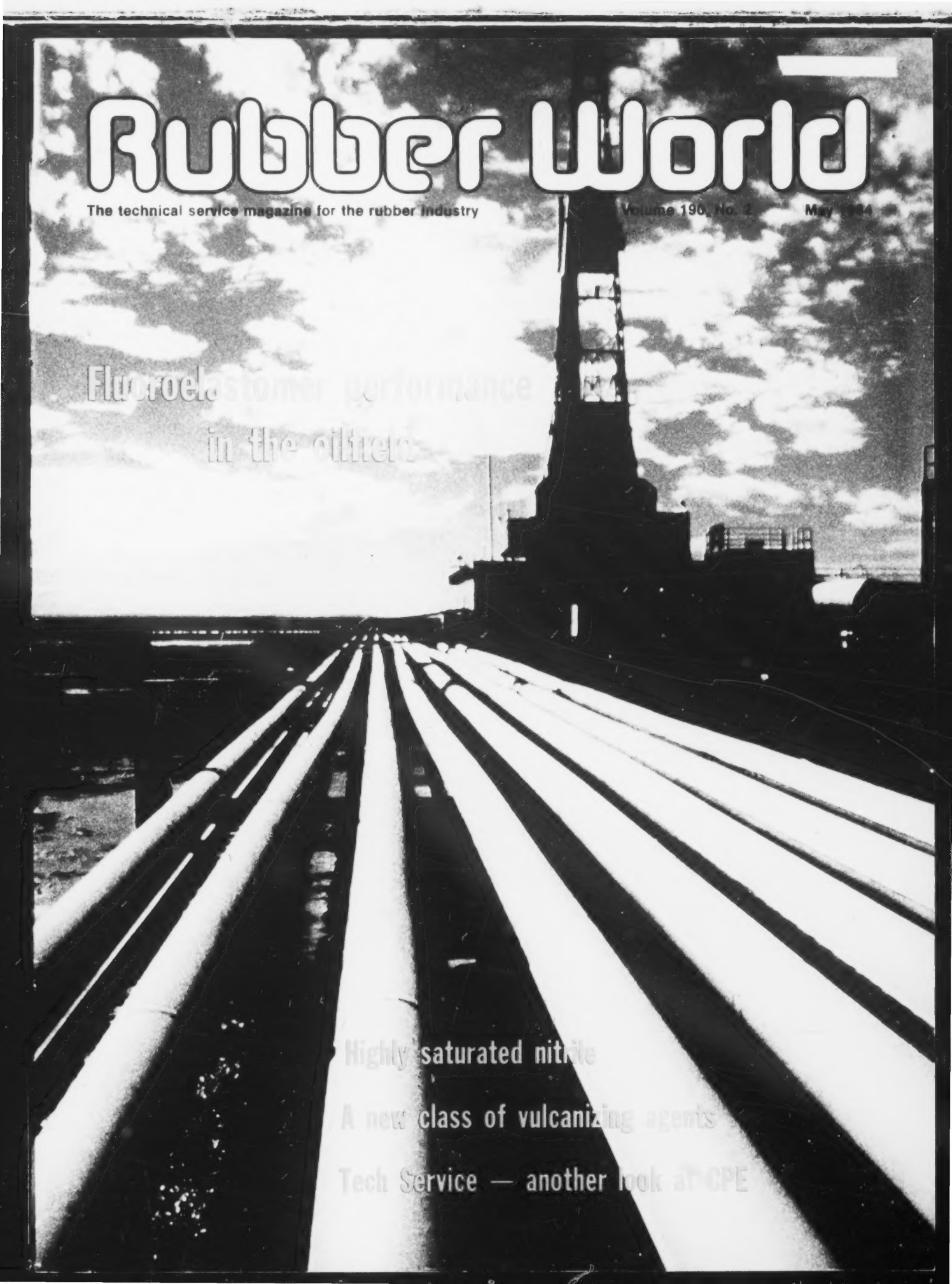
**RMA 1983 tire & tube shipments & production report (figures in thousands of units)**

| Passenger Tires | 1983* | 1982 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 43,845 | 33,981 | +29.03 |
| Radial | 36,599 | 28,415 | +28.80 |
| Replacement | 133,964 | 130,539 | +2.62 |
| Radial | 93,915 | 86,000 | +9.20 |
| Export | 4,206 | 2,949 | +42.62 |
| Radial | 2,899 | 1,521 | +90.60 |
| Total | 182,015 | 167,469 | +8.69 |
| Radial | 133,413 | 115,936 | +15.07 |
| Production | 156,256 | 149,481 | +4.53 |
| Radial | 109,796 | 102,322 | +7.30 |
| Ending Inventory | 27,953 | 33,125 | −15.61 |
| Radial | 20,333 | 24,946 | −18.49 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 5,519 | 4,652 | +18.64 |
| Radial | 2,614 | 1,910 | +36.86 |
| Replacement | 30,301 | 28,149 | +7.65 |
| Radial | 10,268 | 8,266 | +24.22 |
| Export | 1,030 | 966 | +6.63 |
| Radial | 483 | 273 | +76.92 |
| Total | 36,850 | 33,767 | +9.13 |
| Radial | 13,365 | 10,449 | +27.91 |
| Production | 30,667 | 29,019 | +5.68 |
| Radial | 9,740 | 7,634 | +27.59 |
| Ending Inventory | 5,387 | 6,830 | −21.13 |
| Radial | 2,021 | 2,638 | −23.39 |

*Passenger & truck & bus figures for the year are within + or − 2% of actual since RMA had to estimate company data for a portion of the reporting period.

**1982 Census of Manufacturers**

| Year | Companies[2] (no.) | All establishments: Total (no.) | All establishments: With 20 employees or more (no.) | All employees: Number (1,000) | All employees: Payroll (million dollars) | Production workers: Number (1,000) | Production workers: Hours (millions) | Production workers: Wages (million dollars) | Value added by manufacture (million dollars) | Cost of materials (million dollars) | Value of shipments (million dollars) | New capital expenditures (million dollars) | End-of-year inventories (million dollars) | Ratios: Specialization (percent) | Ratios: Coverage (percent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INDUSTRY 3011, TIRES AND INNER TUBES** | | | | | | | | | | | | | | | |
| 1982 Census | 100 | 160 | 99 | 70.5 | 1 739.6 | 54.8 | 101.3 | 1 288.4 | (NA) | 4 603.7 | 9 361.1 | 235.6 | (NA) | 99 | 99 |
| 1977 Census | 121 | 200 | 126 | 114.0 | 1 832.4 | 88.3 | 176.4 | 1 366.0 | 4 347.3 | 4 803.0 | 8 971.0 | 289.0 | 1 172.1 | 96 | 99 |
| 1972 Census | 136 | 206 | 126 | 107.5 | 1 214.1 | 83.1 | 168.9 | 908.1 | 3 070.8 | 2 745.1 | 5 747.1 | 187.1 | 768.4 | 97 | 99 |
| **INDUSTRY 3069, FABRICATED RUBBER PRODUCTS, N.E.C.** | | | | | | | | | | | | | | | |
| 1982 Census | 1 170 | 1 332 | 658 | 87.1 | 1 528.7 | 64.5 | 127.9 | 971.4 | (NA) | 3 036.9 | 6 193.6 | 205.2 | (NA) | 85 | 92 |
| 1977 Census | 1 127 | 1 280 | 621 | 98.5 | 1 164.0 | 77.1 | 153.3 | 795.4 | 2 351.9 | 2 231.2 | 4 565.0 | 135.0 | 510.5 | 88 | 90 |
| 1972 Census | 965 | 1 103 | 605 | 99.0 | 808.8 | 77.4 | 153.7 | 559.7 | 1 573.1 | 1 273.0 | 2 830.9 | 88.5 | 332.8 | 84 | 89 |



# Rubber World

The technical service magazine for the rubber industry

Volume 190, No. 2 May 1984

Fluoroelastomer performance in the oilfield

Highly saturated nitrile

A new class of vulcanizing agents

Tech Service — another look at CPE

# Rubber World

**The technical service magazine for the rubber industry**

Fluoroelastomers in the oilfield p. 16


**10 Business Briefs**
acquisitions, expansions; contracts, licenses; financial statements; markets, news.

**14 Tech Service — CPE: let's take another look**
by Jon Menough, contributing technical service editor. Thiadiazole curing necessitates further study of chlorinated polyethylene in new applications.

**16 Fluoroelastomer performance in the oilfield**
by J.L. Kosmala, A.M. Sohlo and B.H. Spoo, 3M Commercial Chemicals Div. Article updates the compatibility data available on fluoroelastomers in high temperature, high pressure and chemically aggressive applications common in the oil patch.

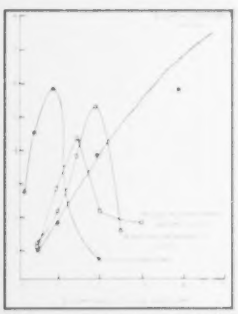
Highly saturated nitrile p. 32


**32 Highly saturated nitrile elastomers — a new high temperature chemical resistant elastomer**
by Kinro Hashimoto, Noboru Watanabe and Akira Yoshioka, Nippon Zeon Co. Authors demonstrate the properties of HSN, in particular its thermal and chemical resistance and show its properties under environmental conditions to which the rubber parts are usually exposed in oil field operations.

**49 Bisperoxycarbamates: a new class of vulcanizing agents that possess bound antioxidant properties**
by Claude Hepburn, University of Technology and Abu Amu, Rubber Research Institute of Malaysia. Article covers the synthesis of new bisperoxycarbamates and their properties as crosslinking agents for the vulcanization of rubber.

**61 New Patents**
edited by Bob Samples, Akron Rubber Development

**66 Techno Mart**
edited by David Given, technical editor.

New vulcanizing agents p. 49

## Departments


| | | | |
|---|---|---|---|
| 4 | Editorial | 64 | Calendar |
| 7 | Mailbag | 77 | Jobs & People |
| 62 | Meetings | 79 | New Literature |


## Cover

**Cover photo courtesy of 3M Company**


A Lippincott & Peto Publication/ Volume 190. No. 2/May 1984

| USA carbon black industry data (metric tons) | | | |
|---|---|---|---|
| | | 1983 Year | Percentage Change Year 83 vs. Year 82 |
| N-100 (SAF) | Prod. | 21,443 | +27.0% |
| | Ship. | 21,888 | +29.6% |
| N-200 (ISAF) | Prod. | 126,976 | +16.1% |
| | Ship. | 129,600 | +16.3% |
| N-300 (HAF) | Prod. | 486,419 | + 6.6% |
| | Ship. | 496,411 | + 7.7% |
| N-500 (FEF) | Prod. | 93,979 | ( 6.2%) |
| | Ship. | 96,679 | ( 5.4%) |
| N-600 (GPF) | Prod. | 286,941 | + 8.5% |
| | Ship. | 293,711 | +12.7% |
| N-700 (SRF) | Prod. | 116,505 | +20.1% |
| | Ship. | 122,570 | +25.9% |
| Total | Prod. | 1,132,263 | + 8.4% |
| | Ship. | 1,160,859 | +10.6% |
| Domestic Shipments (Included Above) | | 1,140,129 | +11.5% |

| SBR black rubber production (metric tons) | | |
|---|---|---|
| | Year | Year 83 vs. Year 82 |
| Net polymer | 125,347 | ( 7.4%) |
| Oil | 48,011 | (12.8%) |
| Oil % of net polymer | 38.3% | |
| Net rubber | 173,358 | ( 9.0%) |
| Net rubber % of dry SBR | 21.5% | |
| Carbon black | 83,815 | ( 1.1%) |
| Total SBR black rubber | 257,173 | ( 6.5%) |

for the year was $4.3 million on sales of $63.4 million.

**Rubbermaid Inc.** had earnings of $10 million for the first quarter on sales of $126.7 million.

**Standard Products Co.** reported third quarter net income was $6 million with sales of $84.6 million.

**Uniroyal** reported first quarter earnings were $17.1 million on sales of $540 million.

## Markets, news

Production of furnace black in 1983 increased 8% and shipments were up 11% from 1982 levels. Production reached 1,132 thousand metric tons and shipments were at 1,161 thousand metric tons according to Columbian Chemicals. Demand in all grades was up except N-500 which was down to the lowest level in 27 years. Plant inventory for the year diminished to the lowest since 1965 to 68 mmt, a three week supply, ranging from two and a half weeks in N-300, N-500 and N-600 to four weeks in N-200 and N-700. N-100 inventory is at a 5½ week supply.

Dry rubber consumption in the U.S. increased 5% over 1982 to 2,387 thousand metric tons, the strongest in four years, with demand in EPDM, polybutadiene and natural rubber also the highest in four years. Nitrile rubber consumption of 50 mmt was 13% higher than 1982 but was the second lowest level in eight years. Both rubber ratios were higher than 1982: the synthetic share, from 72.7% to 73.3% and carbon black, from 44.9 to 47.8 parts per hundred rubber.

Meanwhile, the Federal Trade Commission is attempting to block two proposed acquisitions in the carbon black industry. The FTC says Bass Brothers purchase of Ashland Chemical's carbon black division and Consolidated Mining & Industries' attempt to purchase Continental Carbon should substantially reduce competition in the industry. Bass Brothers own Sid Richardson Co. and Consolidated is the parent firm of Columbian Enterprises.

The International Institute of Synthetic Rubber Producers has forecast the demand for synthetic rubber will be rising 3.3% per year or about 0.5% greater than natural rubber. The worldwide use of synthetic vs. natural as a percent of total rubber consumed is predicted to increase slightly to 67.1% by 1988. The centrally planned economy countries should experience a growth rate somewhat higher compared to the non-CPEC regions.

SBR will continue to be the top rubber consumed accounting for more than 30% of total new rubber consumption. This year the IISRP estimated consumption of SBR carboxylated latex for the first time. This product represents approximately 11% of total synthetic.

| IISRP new rubber consumption forecast Worldwide forecast by region (excluding CPEC) (1000 metric tons) | | | |
|---|---|---|---|
| **Synthetic rubber** | **1983** | **1984** | **1988** |
| North America | 1,962 | 2,047 | 2,215 |
| W. Europe, Africa, M. East | 1,506 | 1,532 | 1,634 |
| Asia and Oceania | 1,087 | 1,104 | 1,242 |
| Latin America | 439 | 457 | 540 |
| TOTAL | 4,994 | 5,140 | 5,631 |
| **Natural rubber** | | | |
| North America | 752 | 778 | 832 |
| W. Europe, Africa, M. East | 986 | 997 | 1,037 |
| Asia and Oceania | 1,208 | 1,223 | 1,408 |
| Latin America | 163 | 171 | 198 |
| TOTAL | 3,110 | 3,169 | 3,469 |
| **Total rubber** | | | |
| North America | 2,714 | 2,825 | 3,047 |
| W. Europe, Africa, M. East | 2,492 | 2,529 | 2,671 |
| Asia and Oceania | 2,295 | 2,327 | 2,644 |
| Latin America | 603 | 628 | 738 |
| World (Excluding CPEC) | 8,104 | 8,309 | 9,100 |

| IISRP total new rubber consumption forecast Worldwide (excluding centrally planned economy countries) (thousand metric tons) | | | | |
|---|---|---|---|---|
| | **1982** | **1983** | **1984** | **1988** |
| SBR-solid | 2,266 | 2,355 | 2,414 | 2,618 |
| SBR-latex* | 278 | 293 | 303 | 335 |
| Polybutadiene | 813 | 855 | 884 | 978 |
| Ethylene/propylene | 308 | 343 | 360 | 416 |
| Polychloroprene | 231 | 241 | 247 | 259 |
| Nitrile-solid & latex | 162 | 167 | 177 | 196 |
| Other synthetics** | 757 | 740 | 754 | 828 |
| Total synthetics | 4,815 | 4,994 | 5,139 | 5,630 |
| Natural rubber | 2,980 | 3,110 | 3,169 | 3,469 |
| Total new rubber | 7,795 | 8,104 | 8,308 | 9,099 |
| Synthetic percent | 61.8 | 61.6 | 61.9 | 61.9 |
| Carboxylated SBR latex | 580 | 636 | 658 | 705 |

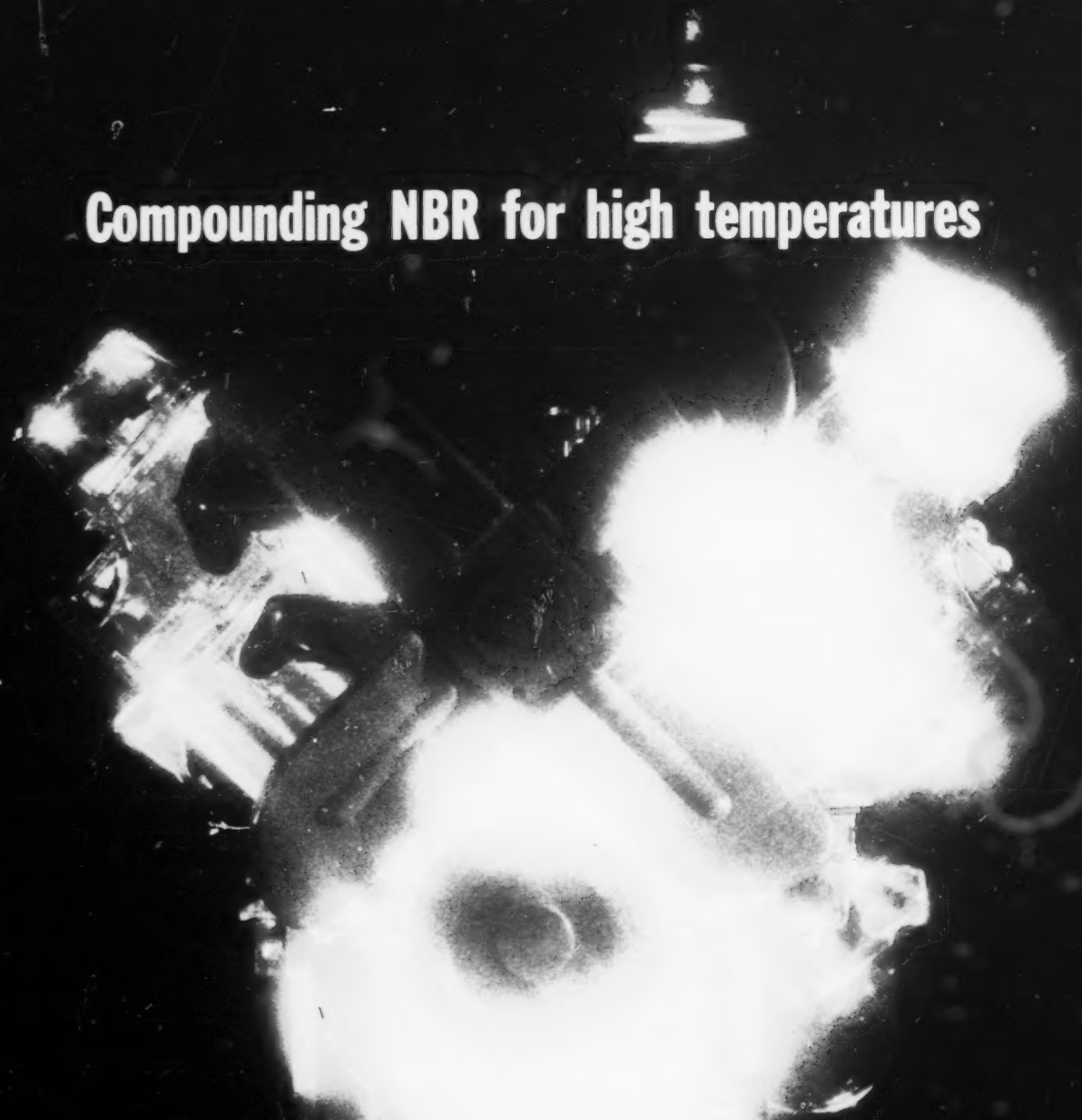
*Excluding carboxylated latex
**Includes butyl and polyisoprene rubbers

# Rubber World

The technical service magazine for the rubber industry

Volume 190, No. 3

June 1984



## Compounding NBR for high temperatures

## Impro

## Optimizing c ixing

## Thermic aspects of injection molding

# Rubber World

**The technical service magazine for the rubber industry**

Compounding NBR p. 16


**6 Business Briefs**
Acquisitions, expansions; contracts, licenses; financial statements; price changes; markets, news.

**14 Tech Service — HSN: adding a little hydrogen**
by Jon Menough, contributing technical service editor. Highly saturated nitrile rubbers fill in several areas not handled by other elastomers. Its unique properties make it suitable for many applications.

**16 Compounding NBR for high temperature applications**
by J.R. Dunn, Polysar Limited. Advances in NBR compounding now permit many specifications for longer life at higher temperatures.

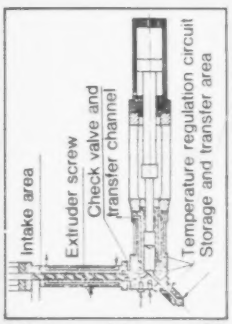
**28 Optimization of carbon black mixing for energy savings**
by S. Wolff, Degussa AG. Author examines the mixing process of various carbon blacks under the viewpoint of mixing energy.

**34 Improved peroxide cures for chlorosulfonated polyethylene**
by W. Honsberg, E.I. duPont de Nemours. The addition of certain polyfunctional alcohols, especially pentaerythritol, as promoters to chlorosulfonated polyethylene/peroxide recipes which lead to higher states of cure, are examined.

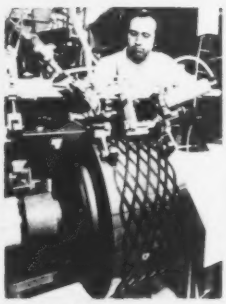
**39 Thermic aspects of rubber injection molding**
by James Jennett, REP Corp. Part 1 of a two part article deals with extruder design, press parameter setting, and the role of injection and the influence and utilization of its parameters.

**46 New Patents**
edited by Bob Samples, Akron Rubber Development

**47 Techno Mart**
edited by David Given, technical editor.


Injection molding p. 39



Techno Mart p. 47

## Departments


| | | | |
|---|---|---|---|
| 4 | Editorial | 60 | Jobs & People |
| 5 | Mailbag | 61 | New Literature |
| 47 | Meetings | 64 | Advertisers Index |


## Cover

**Cover photo courtesy of Polysar Ltd.**


A Lippincott & Peto Publication/ Volume 190, No. 3/June 1984

**Carlisle Corp.** earned $7.78 million on sales of $129.7 million for the first quarter.

**Compo Industries** reported second quarter revenues were $24.63 million and net income was $626,000.

**Crompton & Knowles'** first quarter earnings were $1.81 million on sales of $59.87 million.

**Freeport-McMoran** reported first quarter earnings of $22 million on revenues of $202 million.

**Goodyear** reported worldwide sales for the first quarter were $2.51 billion and earnings were $111.8 million.

**Jones & Vining** announced first quarter earnings were $520,000 on sales of $9.1 million.

**Lubrizol** posted first quarter revenues of $212.2 million and net income of $16.9 million.

**Myers Industries** reported first quarter net sales of $18.6 million and net income of $657,000.

**Park-Ohio** posted a loss of $115,000 for the first quarter with sales of $44.7 million.

**Petrolane Inc.** reported income for the quarter was $5.2 million on revenues of $294.5 million.

**Pfizer Inc.** for the first quarter was $127.7 million on worldwide sales of $919.8 million.

**Sheller-Globe** reported second quarter earnings were $10.4 million on sales of $217.4 million.

**Sybron Corp.** reported first quarter earnings of $2 million on sales of $141.3 million.

**Yokohoma Rubber** reported 1983 sales reached Y258,597 million and profits were Y1,306.

## Price changes

In a move to simplify its pricing procedure, **C.P. Hall** announced that all drum plasticizers sold in one to nine drum quantities will be priced at the 10 drum price, freight collect. (The 10 drum price is truckload plus 5¢ per pound, freight prepaid.) The new pricing applies to all shipments of less than 10 drums of all Hall plasticizers including Plasthalls, TegMers, Paraplexes and Monoplexes.

**Hercules Inc.** increased the prices of synthetic ester lubricant 5¢/lb in bulk quantities.

**Goodyear** raised the price of its polyethylene terephthalate resin by 3¢/lb.

## Markets, news

World rubber consumption in 1983 was 12.13 million metric tons, an increase of 4.6% over 1982 according to the International Rubber Study Group. Growth in synthetic rubber was 3%, totalling 8.18 million tons while consumption of natural rubber increased 8.1% to 3.95 million tons, accounting for 32.5% of the total. Japan and the U.S. led the recovery with gains of 9.8% and 8.5% respectively. These two countries consumed 3.9 million tons, almost one third of the total. The European Economic Community's consumption was virtually unchanged at 1.92 million tons while Eastern Europe was up 1% to 2.8 million tons. The IRSG said the main factors underlying the recovery were a 4% rise in industrialized countries overall output and higher tire production aided by sharp increases in vehicle output especially in the U.S. where automobile production rose 24% and commercial vehicles 27%. Malaysia continued to be the top producer of natural rubber with a 3% increase to 1.5 million tons. Indonesia experienced the largest increase in production, rising 14.2% to over one million tons.

Value of shipments in the reclaimed rubber industry hit $3 million in 1982 according to the U.S. Department of Commerce in its census of manufacturers. Shipments totalled $41.6 million in 1977, the last time a full census was taken.

The U.S. market for specialty polymer blends and alloys, valued at over $450 million in 1983, will nearly double in size over the next five year according to a study by C.H. Kline & Co. Kline predicts the sales will reach in excess of $900 million in 1988, representing real growth

**World supply/demand position of rubber 1982/1983 (000 tonnes)**

| **Natural rubber** | | | |
|---|---|---|---|
| | **1982** | **1983** | **% Change** |
| Production | 3,755 | 3,985 | + 6.1 |
| Consumption | 3,655 | 3,950 | + 8.1 |
| Change in stocks | +100 | +35 | |
| **Synthetic rubber** | | | |
| | **1982** | **1983** | **% Change** |
| Production | 7,815 | 8,215 | + 5.1 |
| Consumption | 7,940 | 8,180 | + 3.0 |
| Change in stocks | —125 | +35 | |
| **World rubber consumption** | | | |
| | **1982** | **1983** | **% Change** |
| NR | 3,655 | 3,950 | + 8.1 |
| SR | 7,940 | 8,180 | + 3.0 |
| Total | 11,595 | 12,130 | + 4.6 |
| % SR | 68.5 | 67.4 | |

**Production of natural rubber (000 tonnes)**

| | **1982** | **1983** | **% Change** |
|---|---|---|---|
| Malaysia | 1517 | 1562 | + 3.0 |
| Indonesia | 880 | 1005 | +14.2 |
| Thailand | 552 | 580 | + 5.1 |
| Sri Lanka | 125 | 135 | + 8.0 |
| Vietnam | 40 | 45 | — |
| Kampuchea | 1 | 5 | — |
| India | 156 | 168 | + 1.2 |
| Burma | 20 | 25 | — |
| China P.R. | 140 | 150 | + 7.1 |
| Philippines | 74 | 75 | + 1.3 |
| Liberia | 68 | 62 | — 8.8 |
| Nigeria | 50 | 49 | — 2.0 |
| Zaire | 16 | 16 | — |
| U.R. Cameroon | 17 | 16 | — 5.9 |
| Ivory Coast | 27 | 24 | —11.1 |
| Brazil | 33 | 35 | + 6.1 |
| Others | 30 | 31 | + 3.3 |
| World total | 3755 | 3985 | + 6.1 |

**Consumption of natural rubber (000 tonnes)**

| | **1982** | **1983** | **% Change** |
|---|---|---|---|
| U.S.A. | 585 | 665 | +13.7 |
| EEC | 632 | 636 | + 0.6 |
| Other Western Europe | 205 | 220 | + 7.3 |
| Eastern Europe | 370 | 400 | + 8.1 |
| China | 290 | 360 | +24.1 |
| Australia | 36 | 30 | —16.7 |
| Brazil | 68 | 70 | + 2.9 |
| Canada | 76 | 87 | +14.4 |
| India | 197 | 205 | + 4.1 |
| Japan | 439 | 502 | +14.5 |
| Others | 755 | 775 | + 2.6 |
| World Total | 3655 | 3950 | + 8.1 |

## Table 1 — Historical statistics for the reclaimed rubber industry

| Year[1] | All establishments[2] | | All employees | | Production workers | | | Value added by manufacture (million dollars) | Cost of materials (million dollars) | Value of shipments (million dollars) | New capital expenditures (million dollars) | End-of-year inventories (million dollars) | Ratios | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Companies[2] (no.) | Total (no.) | With 20 employees or more (no.) | Number (1,000) | Payroll (million dollars) | Number (1,000) | Hours (millions) | Wages (million dollars) | | | | | Specialization (percent) | Coverage (percent) |
| **INDUSTRY 3031, RECLAIMED RUBBER** | | | | | | | | | | | | | | |
| 1982 Census | 26 | 26 | 9 | 9 | 14.8 | 8 | 1.1 | 10.0 | (*) | 32.5 | 63.0 | 9 | (*) | (D) | 100 |
| 1977 Census | 21 | 21 | 9 | 9 | 11.5 | 7 | 1.5 | 8.4 | 24.8 | 16.8 | 41.6 | 5 | 3.7 | 100 | 62 |
| 1972 Census | 19 | 20 | 9 | 9 | 9.1 | 8 | 1.5 | 6.9 | 15.6 | 13.1 | 29.7 | 7 | 2.7 | 96 | 55 |


# 1984 BLUE BOOK

At your fingertips, the most comprehensive and up-to-date technical information available anywhere today... in the **1984 BLUE BOOK of Materials, Compounding Ingredients and Machinery for Rubber.**

In the **BLUE BOOK** you'll find detailed information on every raw material used by the rubber industry — including vulcanization materials, protective materials, processing aids, extenders and fillers, lubricants, latex compounding materials, natural and synthetic rubbers and coloring materials.

To help you locate the best materials, most ingredients are listed generically as well as by trade name. You'll also appreciate the "Supplier to the Rubber Industry" section, which gives you names, addresses and important technical information on hundreds of suppliers of materials, equipment, and custom mixing services.

Return the coupon today to get your copy of the rubber industry's most important reference work: the **1984 BLUE BOOK.**

**Absolutely essential for:**

**compounders • chemists**
**purchasing agents • salespeople**
**marketing and research personnel**

**Rubber World Blue Book,**
1867 W. Market St., Akron, OH 44313

Please send me_____copy(ies) of the **1984 BLUE BOOK of Materials, Compounding Ingredients and Machinery for Rubber.**

**Domestic (U.S. & Canada):** $63.00 + postage & handling charges. (N.Y. residents add 8% tax; Ohio residents add 5% tax; Calif. residents add 6% tax.)
**All others:** $79.00 (Includes air mail postage). Copies to be shipped outside U.S.A. **must** be prepaid

☐ Check enclosed

☐ Bill me (U.S. and Canada only)

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Country _____


of almost 15% annually. The leading four specialty blends, PPO/PS, PP/EPDM, ABS/PVC and modified nylon accounted for 84% of the total pounds in 1983, but will only represent 67% of the total demand of specialty blends and alloys in five years. Consumption of these four will continue to grow but not at the rapid rate expected of new blends including PC/PBT and PE/nylon. The transportation industry is currently the most important application for specialty blends and alloys, accounting for 40% of the poundage.

Production of lead free zinc oxide in January declined slightly from the previous month according to the U.S. Bureau of Mines, but the total was 69% higher than that of January 1983. Production was 11,535 metric tons.

Footwear imports climbed to record levels for the third month in a row as Commerce Department figures show a total of 68.9 million pairs of shoes imported into the U.S. in March bringing first quarter totals to almost 200 million pairs, a rise over 20% over the first quarter of 1983. Imports now account for 70% of the U.S. market.

### Production of synthetic rubber (000 tonnes)

| | 1982 | 1983 | % Change |
|---|---|---|---|
| U.S.A. | 1829 | 1978 | + 8.1 |
| Canada | 182 | 181 | — 0.5 |
| EEC | 1620 | 1700 | + 5.5 |
| Other Western Europe | 104 | 107 | + 2.9 |
| Eastern Europe | 2425 | 2475 | + 2.1 |
| Japan | 931 | 1003 | + 7.7 |
| China P.R. | 115 | 133 | +15.7 |
| Australia | 43 | 36 | —16.3 |
| Brazil | 228 | 221 | — 3.1 |
| India | 32 | 34 | + 6.3 |
| S. Africa | 32 | 28 | —12.5 |
| Argentina | 46 | 48 | + 4.3 |
| Mexico | 106 | 108 | + 1.9 |
| S. Korea | 64 | 91 | +42.2 |
| Taiwan | 58 | 70 | +20.7 |
| World Total | 7815 | 8215 | + 5.1 |

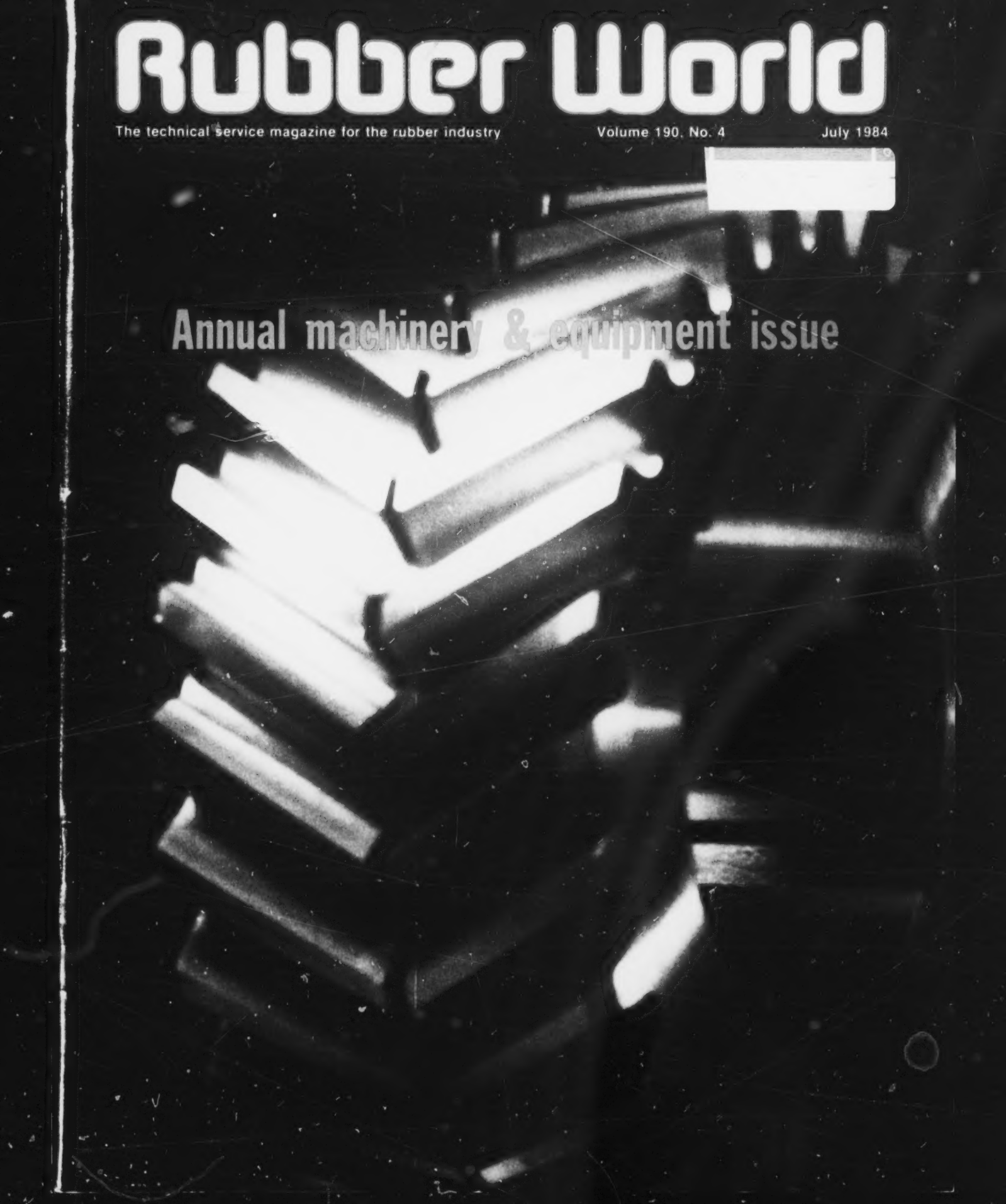
### Consumption of synthetic rubber (000 tonnes)

| | 1982 | 1983 | % Change |
|---|---|---|---|
| U.S.A. | 1765 | 1885 | + 6.8 |
| E.E.C. | 1293 | 1280 | — 0.2 |
| Other Western Europe | 380 | 400 | + 5.3 |
| Eastern Europe | 2400 | 2400 | — |
| China | 150 | 150 | — |
| Australia | 56 | 44 | —21.4 |
| Brazil | 195 | 199 | + 2.1 |
| Canada | 182 | 195 | + 7.1 |
| India | 50 | 53 | + 6.0 |
| Japan | 797 | 855 | + 7.3 |
| Others | 670 | 720 | + 7.5 |
| World Total | 7940 | 8180 | + 3.0 |

# Rubber World

The technical service magazine for the rubber industry

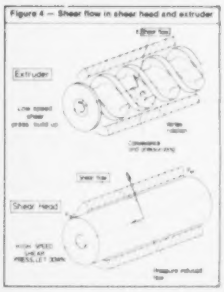
Volume 190, No. 4 July 1984



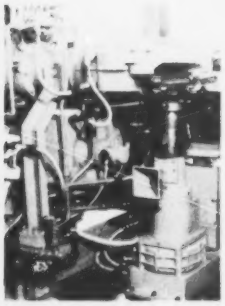
## Annual machinery & equipment issue

# Rubber World

**The technical service magazine for the rubber industry**


Shear head technology p. 26



Different concepts of rubber extruder p. 36

Corporate profile p. 63


**6 Business Briefs**
Acquisitions, expansions; contracts, licenses; financial statements; price changes; markets, news.

**12 Tech Service—Gearing for better lubrication**
by Jon Menough, contributing technical service editor. When properly cared for, machinery lasts longer, unscheduled downtime is reduced and plant operating costs are lower. This article discusses how gear lubrication can help achieve these ends.

**15 Thermic aspects of rubber injection molding**
by James Jennett, REP Corp. Part 1 of this article appeared in the June issue of *Rubber World*. In this installment the author looks at mold design, cold runner blocks and microprocessor controls versus conventional controls with regard to statistical process control.

**26 Shear head technology—A new development for better extrusion**
by Guenther H. Niehus, Krupp Industrietechnik. The requirements of the rubber industry for an economical way to improve productivity and better control of production processes has lead to the development of the shear head extrusion technology which is examined in this article.

**36 The development potential of different concepts of rubber extruder**
by Paul Meyer, Frenkel C-D Central Co. This article compares the following types of extruders: The Plastiscrew, the E.V.K., the Pin Type, the Cavity Transfer Mixer, and the Transfermix I and II.

**42 Manufacturers increase machinery purchases**
by Don R. Smith, managing editor. A *Rubber World* survey of rubber products manufacturers shows an increase in machinery buying among the results.

**44 Used, rebuilt machinery suppliers and capabilities**
A grid on rebuilding capabilities of suppliers to the rubber industry is accompanied by an industry directory.

**48 Instrumentation and test equipment suppliers**
A directory of these suppliers to the rubber industry along with their products.

**54 Techno Mart**
edited by David Given, technical editor.

**61 New Patents**
edited by Bob Samples, Akron Rubber Development

**63 Corporate profile '84**


## Departments


4 Editorial
106 Meetings
113 Jobs & People
114 New Literature
116 Advertisers Index


## Cover

**Cover photo courtesy of Illinois Gear**


A Lippincott & Peto Publication/ Volume 190, No. 4/July 1984

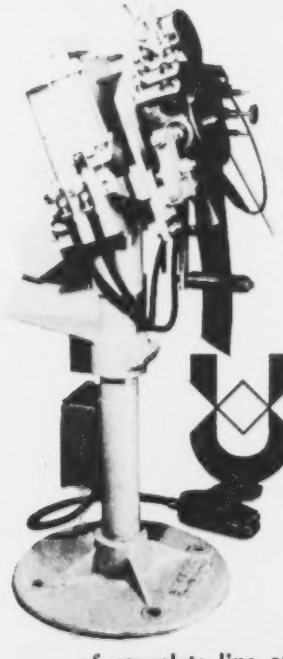
## RMA monthly tire shipments & production report through March 1984 (figures in thousands of units)

| Passenger Tires | 1984 | 1983 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 13,680 | 9,213 | +48.49 |
| Radial | 11,423 | 7,707 | +48.22 |
| Replacement | 33,262 | 29,372 | +13.24 |
| Radial | 26,119 | 20,160 | +29.56 |
| Export | 1,616 | 893 | +80.96 |
| Radial | 1,205 | 550 | +119.09 |
| Total | 48,558 | 39,478 | +23.00 |
| Radial | 38,747 | 28,417 | +36.35 |
| Production | 44,178 | 39,897 | +10.73 |
| Radial | 32,502 | 27,776 | +17.01 |
| Ending Inventory | 92,386 | 41,569 | +122.25 |
| Radial | 65,351 | 31,317 | +108.68 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 1,912 | 1,178 | +62.31 |
| Radial | 992 | 581 | +70.74 |
| Replacement | 7,300 | 6,275 | +16.33 |
| Radial | 2,432 | 1,885 | +29.02 |
| Export | 350 | 243 | +44.03 |
| Radial | 162 | 93 | +74.19 |
| Total | 9,562 | 7,696 | +24.25 |
| Radial | 3,586 | 2,559 | +40.13 |
| Production | 9,190 | 7,971 | +15.29 |
| Radial | 3,341 | 2,447 | +36.53 |
| Ending Inventory | 19,208 | 8,718 | +120.33 |
| Radial | 7,589 | 3,756 | +102.05 |

cently by the Environmental Protection Agency, whose notice of proposed rulemaking prompted PMA's design of the container, a drum which reduces exposure of the chemical by workers to a minimum. The PMA resolution for the drum reads: "Be it resolved that the proposed blow-molded drum insert be approved as an acceptable container for the distribution of MOCA within the castable polyurethane industry and be it further resolved that representatives of the PMA are hereby authorized to propose to EPA the adoption of the proposed blow-molded insert drum container as the principal solution to the concerns raised by EPA in its May 1983 Advanced Notice of Proposed Rulemaking for MOCA." In addition to the drum itself, overall regulation by EPA will include exposure tesets at the Patel Institute in Columbus, Ohio, on worker exposure levels, safety labeling, and a decontamination procedure for the drum liner. The PMA Safety & Health Committee will pursue testing on decontamination of the liner as part of its recommendation to the EPA.

The International Trade Commission's finding that the domestic shoe industry is not being injured by imports was "appalling," "devastating," "incomprehensible," and "completely wrong," said Footwear Industry spokesman George Langstaff. He said that in gauging the industry's profitability, the ITC completely ignored the fact that 66 factories closed since 1982.


**Radial Tire Bead Flippers**



Utility Bead Flippers can handle your requirements from 10" diameter through 49" diameter beads.

®Utility
Manufacturing Co.
6705 - 14th Avenue
Kenosha, Wisconsin 53140
Phone (414) 654-9220

Send for free catalog of complete line of Utility products today


## RMA industry rubber report through March 1984 (figures are expressed in metric tons)

| | Cumulative 1984 | Cumulative 1983 | % Change 84 vs 83 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 831,030 | 668,474 | 24.47 |
| Imports | 285,459 | 193,884 | 47.23 |
| Exports | 85,153 | 72,143 | 18.03 |
| Apparent Consumption | 747,071 | 598,975 | 24.72 |
| **Total Natural Rubber** | | | |
| Imports | 224,656 | 161,275 | 39.30 |
| Exports | 5,291 | 4,957 | 6.74 |
| Apparent Consumption | 213,724 | 164,314 | 30.07 |
| % Total new rubber | 28.60 | 27.43 | |
| **Total Synthetic Rubber** | | | |
| Production | 546,571 | 474,590 | 15.17 |
| Imports | 60,803 | 32,609 | 86.46 |
| Exports | 79,862 | 67,186 | 18.87 |
| Apparent Consumption | 533,346 | 434,661 | 22.70 |
| % Total new rubber | 71.39 | 72.56 | |
| **Total SBR** | | | |
| Production | 253,969 | 229,344 | 10.74 |
| Imports | 18,674 | 12,524 | 49.11 |
| Exports | 24,833 | 19,655 | 26.34 |
| Apparent Consumption | 242,248 | 218,554 | 10.84 |
| **Total Nitrile** | | | |
| Production | 16,472 | 12,777 | 28.92 |
| Imports | 2,846 | 1,979 | 43.81 |
| Exports | 1,739 | 1,431 | 21.52 |
| Apparent Consumption | 17,666 | 13,326 | 32.57 |
| **Polybutadiene** | | | |
| Production | 86,167 | 76,630 | 12.45 |
| Imports | 17,231 | 7,239 | 138.03 |
| Exports | 6,251 | 3,525 | 77.33 |
| Apparent Consumption | 101,316 | 77,094 | 31.42 |
| **Ethylene-Propylene** | | | |
| Production | 52,368 | 39,314 | 33.20 |
| Imports | 231 | 22 | 950.00 |
| Exports | 7,988 | 7,457 | 7.12 |
| Apparent Consumption | 45,495 | 32,975 | 37.97 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 109,948 | 85,944 | 27.93 |
| Imports | 20,978 | 10,418 | 101.36 |
| Exports | 29,992 | 23,850 | 25.75 |
| Apparent Consumption | 101,122 | 73,036 | 38.46 |
| **Polychloroprene** | | | |
| Production | 27,646 | 30,582 | -9.60 |
| Imports | 843 | 427 | 97.42 |
| Exports | 9,059 | 11,268 | -19.60 |
| Consumption | 25,498 | 19,677 | 29.58 |

## RW survey shows

# Manufacturers increasing machinery purchases

*by Don Smith, managing editor*

There is good news on most fronts for machinery and equipment suppliers to the rubber industry according to the latest survey conducted by *Rubber World*. This survey polled 500 rubber product manufacturers on their machinery buying habits, and the results show that both new equipment manufacturers and used and rebuilt suppliers have increased sales and that this trend should continue through the rest of 1984.

The market has "loosened up" according to one new equipment supplier, saying that the market had been depressed for about three years. He, like others contacted about the survey results, feel their sales have increased significantly in the past year, but like most other areas of the industry this has brought them back to pre-recessionary levels.

The rebound in the rubber industry is evident from the fact that 91% of the respondents said business was either somewhat better or much better than 1983, with 40% stating much better. The remainder indicated there was no change with no one claiming business was worse. The breakdown of the respondents showed 31% served automotive markets, 17% construction, 10.3% chemical with the remaining markets — printing, recreation, oil & gas, mining agriculture, appliances between 5-10%. The principal products manufactured were mechanical goods, accounting for 67% in the survey. Hose and belting was next at 9%, tires and tubes 7.2%, footwear 5.4%, and wire and cable 1.2%.

The upturn in the industry is reflected in the fact that over 45% of the survey respondents said their company increased capital expenditures for rubber machinery this year with the increases averaging 23.5%. Almost 55% said they have already purchased new equipment.

A recent Survey of Current Business conducted by the U.S. Department of Commerce shows expenditures for new plant and equipment in the rubber industry is expected to increase 15.4% as a whole. This is slightly down from the 16.1% increase expected when plans were revealed in November and December of 1983. The current figures come from plans reported in January and February of 1984.

***"They were looking at almost everything we had to offer and some wanted the machinery immediately."***

The Commerce Department figures show expenditures declined 3.4% in 1982 from 1981 and increased 11.9% in 1983 over 1982. The *Rubber World* survey indicates most of the buying in 1983 occurred in the last quarter.

This sudden flurry of equipment purchases bears out what a couple of machinery manufacturers said when they indicated the rubber product manufacturers go on "crash buying" sprees. These suppliers said there was very little activity in the rubber industry until about nine months ago when, as one put it "they were looking at almost everything we had to offer and some wanted the machinery immediately." Some suppliers said it appeared many manufacturers were delaying equipment purchases for various reasons, the recesssion being primary, and were caught off guard when the industry began to turn around and they had to increase production.

The Commerce Department figures show that capacity utilization rates in the rubber industry increased 4.5% in 1983 from September to December and the change from December 1982 to December 1983 was 9.2% indicating that production is up throughout most of the rubber industry. The industry's rate of 82.1% is well above the national average for all manufacturing at 76.9%.

The *RW* survey shows that the machinery in greatest demand are presses, mills, lathes, extruders, grinders and mixers. Testing and measuring equipment purchases haven't increased as much as the production equipment. Almost 28% of the manufacturers purchased this type of equipment since 1983 and 31% planned to purchase in 1984. The largest percentage bought rheometers, which was also the piece most indicated by those intending to buy.

The rubber industry has not jumped on the process control bandwagon with only 35.2% of the companies responding stating they have added PC equipment. Less than 5% of those have added process control to all of their manufacturing lines while the others have added it to such operations as molding, extruding, die cutting and presses.

The used and rebuilt dealers to the industry came out favorably as almost 95% of the companies said they consider purchasing used or rebuilt equipment when they are in need of machinery. Since 1983, 41% have purchased used or rebuilt pieces. Presses were purchased most often accounting for 39% of used and rebuilt purchases, followed by ovens (26%) and lathes, mills, extruders,

**Expenditures for New Plant and Equipment by U.S. Nonfarm Business: Percent Change From Preceding Year**

| | 1982 | 1983 | | 1984 | |
|---|---|---|---|---|---|
| | Actual | Planned[1] | Actual | Planned[2] | Planned[3] |
| Chemicals | −2.4 | 3.2 | .1 | 6.3 | 8.0 |
| Rubber | −3.4 | 8.0 | 11.9 | 16.1 | 15.4 |

[1]Plans reported by business in January and February 1983.
[2]Plans reported by business in November and December 1983.
[3]Plans reported by business in January and February 1984.

**Change in Business Sale: Percent Change From Preceding Year**

| | 1982 | 1983 | | 1984 |
|---|---|---|---|---|
| | Actual | Expected[1] | Actual | Expected |
| Chemicals | −3.4 | 13.4 | 9.5 | 10.6 |
| Rubber | −8.2 | 1[illegible] | 7.8 | 11.2 |

[1]Expectations for 1983 are based on the survey conducted in late January and February 1983.
[2]Includes industries not shown separately.
*Source: U.S. Commerce Dept.*

**Manufacturers' Capacity Utilization Rates: Operating Rates and Ratios of Operating to Preferred Rates[1]**

| Industry and asset size | Operating rates (percent) 1982 June | 1982 Sept. | 1982 Dec. | 1983 Mar. | 1983 June | 1983 Sept. | 1983 Dec. | Ratios of operating to preferred rates 1982 June | 1982 Sept. | 1982 Dec. | 1983 Mar. | 1983 June | 1983 Sept. | 1983 Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemicals | 69.7 | 69.3 | 65.8 | 68.8 | 71.5 | 75.9 | 77.5 | .77 | .77 | .73 | .76 | .79 | .84 | .86 |
| Rubber | 75.5 | 69.7 | 72.9 | 75.8 | 76.1 | 77.6 | 82.1 | .81 | .75 | .78 | .80 | .81 | .83 | .88 |

[1]The survey asks manufacturers to report actual and preferred rates of capacity utilization for the last month of each quarter. Utilization rates for industry and asset-size groups are weighted averages of individual company rates. See "The Utilization of Manufacturing Capacity, 1965-73," Survey of Current Business, July 1974, p. 47.

*Source: U.S. Commerce Dept.*

grinders, and calenders accounting for 8-10% each.

In ranking the considerations for buying used or rebuilt rubber machinery, most manufacturers said that price was the top priority with quality close behind. Condition of the machine, availability and reliability of the seller were mentioned frequently by the respondents with after the sale service and delivery rated the least.

Conversely, price was rated as the least important consideration by rubber product manufacturers when buying a new machine. Perceived quality was rated the top consideration followed by after the sale service, warranties, delivery and operator training.

Although the survey indicates increased activity by the rubber product manufacturers, many implied that an increase in machinery and equipment buying was in the offing. "If business continues to improve, we will be budgeting for a mixing mill and mold shop enlargement," one manufacturer said, reflecting what quite a few respondents said. It seems that while they are enjoying the upturn, many are still leary of the economy with high interest rates being at the base of their worries. They are waiting to see if the recovery is solid and long lasting and not just an aberration. Also the changes occurring in process control have made some hesitate on machinery purchases as one manufacturer said "we get concerned over purchasing a piece of equipment which may be obsolete in two to three years, we have to determine if the piece is adaptable to the new technologies."

***"The industry's capacity utilization rate of 82.1% is well above the national average for all manufacturing at 76.9%."***

Many of the machinery suppliers polled on the results of the survey indicated they have not changed their production schedules, by adding shifts or increasing output just as yet. Most said their business was up considerably over the past two years and some have recalled laid off workers. McNeil Akron recently recalled 40 workers because of their increase in orders and implied they might recall more. Many suppliers said the new activity has helped them reduce inventories with some saying that delivery times were beginning to increase, a problem welcomed because it meant more sales.


# It's a two-way street

Keeping *you* informed means keeping *us* informed. To report to you the latest in rubber industry happenings, the editors of Rubber World rely on many sources of information. One of our most important sources is you, our reader.

We welcome and encourage your input — employe newsletters, meeting reports, equipment releases, letters to the editor, phone calls. Let us know what's happening with your company; what you're thinking. We want to hear from you.

**Rubber World**

P.O. Box 5485
1867 W. Market St.
Akron, Ohio 44313
(216) 864-2122

# Rubber World

The technical service magazine for the rubber industry

Volume 190, No. 5 August 1984

## Emphasis on adhesives

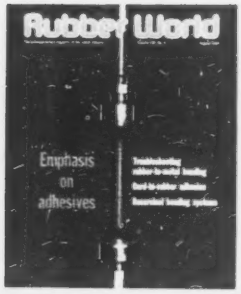
Troubleshooting rubber-to-metal bonding

Cord-to-rubber adhesion

Resorcinol bonding systems

# Rubber World

**The technical service magazine for the rubber industry**

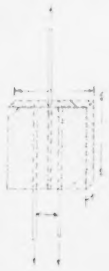




Adhesion troubleshooting p. 18


**6 Business Briefs**
Acquisitions, expansions; contracts, licenses; financial statements; price changes; markets, news.

**12 Tech Service — Using water for the solution.**
by Jon Menough, contributing technical service editor. A look at water-borne adhesives in rubber-to-metal bonding.

**18 Troubleshooting rubber-to-metal bonding problems in transfer molding**
by Everett H. Gibbs, Jr. and John N. Seber, Teledyne Monarch Rubber. When a failure occurs in a rubber part bonded to metal, either through deliberate destruction or in service, the mode of failure is important in determining what steps are to be taken to solve the problem. This article examines the various modes and suggests ways to correct the problem.

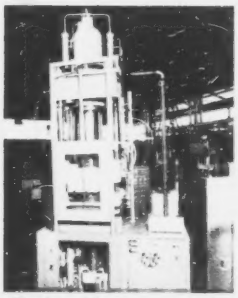



Cord-to-rubber adhesion p. 29


**24 Resorcinol bonding systems for steel cord adhesion**
by Alex Peterson and M.I. Dietrick, Koppers Company. With increased emphasis on longer service life for steel radial passenger and truck tires, it is important that the cord to rubber bonds remain strong and durable over a wide range of exposure conditions. This article shows that resorcinol may be replaced with a thermally stable resorcinol-formaldehyde resin in NR skin compounds without sacrificing unaged and aged adhesion.

**29 Comprehensive evaluation of cord-to-rubber adhesion**
by G.I. Brodsky, Hercules Inc. The author discusses adhesion phenomena and describes a method of testing adhesives in a way which allows one to predict the composite's performance and to find new areas of adhesives applications.

**40 New Patents**
edited by Bob Samples, Akron Rubber Development

Techno-Mart p. 48


**48 Techno Mart**
edited by David Given, technical editor


## Departments


4 Editorial
5 Mailbag
42 Meetings
55 Jobs & People
58 Literature
60 Advertisers Index


## Cover

**Cover photo courtesy of Teledyne Monarch Rubber shows an ASTM D429 method C conical specimen in tension.**


A Lippincott & Peto Publication/Volume 190, No. 5/August 1984

# Business Briefs

## Acquisitions, expansions

**Cabot Corp.** will expand carbon black production capacity at its Waverly, WV facility by at least 25 million pounds annually. The new installation, which will be completed in 10 months, is the first phase of a $7 million to $10 million expansion program.

**Quabug Rubber Co.**, has established a separate custom mixing operating unit which will be mixing most polymers, including SBR, neoprene, EPDM, nitrile, butyl and natural rubber beginning in the fall.

**Hydril** has begun a two-year construction program to expand it's oil field rubber products facility in Humble, TX. The first phase which includes adding 22,000 sq. ft. will be completed in September. The second phase will feature construction of new office buildings, research and development laboratory, raw materials warehouse and a parts distribution center.

**TRW Inc.** purchased Firestone's passenger restraint business.

**Eagle Chemical Co.**, a sales organization representing more than a dozen rubber chemical manufacturers, was formed out of the reorganization of ARC Chemical. Eagle has added warehouses in Memphis, TN and Atlanta, GA.

**Montedison USA** opened a branch office in San Jose, CA.

**Marian Rubber Products Co.** purchased the J.J. Glenn Co., Chicago, IL, a distributor of electrical components.

Reichhold Chemical is constructing a new laboratory for its polyolefin and vinyl materials division adjacent to its business office in Washington Township, NJ.

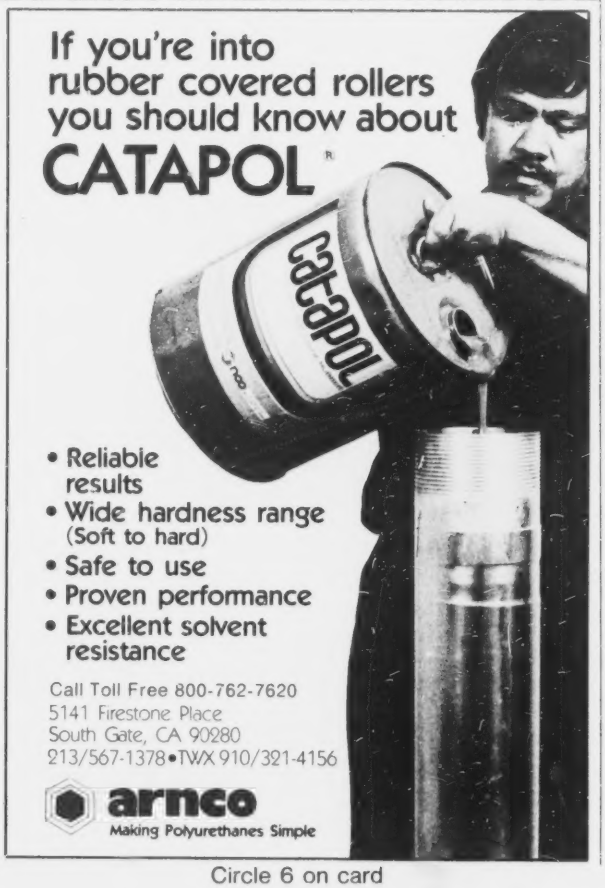
**The Gates Rubber Co.** dedicated its Red Bay, AL plant which specializes in producing long length wrapped hose and radiator hose.

A multi million dollar expansion will increase production at **Ohio Poly Corp.**, a Goodyear subsidiary, by about 25% upon completion by mid-1985 at the company's Carrollton, OH facility.

**Dunlop Olympic Ltd.** acquired **Pacific Polymers Inc.**, a manufacturer of latex gloves for the silicon chip industry.

**RMA industry rubber report through April 1984 (figures are expressed in metric tons)**

| | Cumulative 1984 | Cumulative 1983 | % Change 84 vs 83 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 1,117,913 | 909,908 | 22.86 |
| Imports | 378,123 | 270,181 | 39.95 |
| Exports | 118,282 | 100,708 | 17.45 |
| Apparent Consumption | 981,901 | 805,441 | 21.91 |
| **Total Natural Rubber** | | | |
| Imports | 294,946 | 224,385 | 31.45 |
| Exports | 7,250 | 6,344 | 14.28 |
| Apparent Consumption | 281,833 | 219,621 | 28.33 |
| % Total new rubber | 28.70 | 27.26 | |
| **Total Synthetic Rubber** | | | |
| Production | 739,790 | 639,727 | 15.64 |
| Imports | 83,177 | 45,796 | 81.63 |
| Exports | 111,032 | 94,364 | 17.66 |
| Apparent Consumption | 700,068 | 585,820 | 19.50 |
| % Total new rubber | 71.29 | 72.73 | |
| **Total SBR** | | | |
| Production | 338,690 | 298,054 | 13.63 |
| Imports | 25,163 | 16,392 | 53.51 |
| Exports | 33,524 | 27,104 | 23.69 |
| Apparent Consumption | 318,673 | 288,213 | 10.57 |
| **Total Nitrile** | | | |
| Production | 21,621 | 16,843 | 28.37 |
| Imports | 3,902 | 2,627 | 48.53 |
| Exports | 2,443 | 1,896 | 28.85 |
| Apparent Consumption | 23,765 | 17,403 | 36.56 |
| **Polybutadiene** | | | |
| Production | 119,109 | 107,570 | 10.73 |
| Imports | 24,470 | 10,593 | 131.00 |
| Exports | 8,203 | 5,171 | 58.63 |
| Apparent Consumption | 135,892 | 110,089 | 23.44 |
| **Ethylene-Propylene** | | | |
| Production | 74,487 | 53,854 | 38.31 |
| Imports | 251 | 44 | 512.20 |
| Exports | 11,254 | 10,321 | 9.04 |
| Apparent Consumption | 59,206 | 42,562 | 39.11 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 145,908 | 121,375 | 20.21 |
| Imports | 28,197 | 15,273 | 84.62 |
| Exports | 42,498 | 33,836 | 25.60 |
| Apparent Consumption | 133,672 | 101,209 | 32.08 |
| **Polychloroprene** | | | |
| Production | 39,976 | 42,032 | −4.89 |
| Imports | 1,194 | 870 | 37.24 |
| Exports | 13,110 | 16,036 | −18.25 |
| Consumption | 28,861 | 26,345 | 9.55 |

Circle 6 on card

**RMA monthly tire shipments & production report through April 1984 (figures in thousands of units)**

| Passenger Tires | 1984 | 1983 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 18,000 | 12,924 | +39.28 |
| Radial | 15,030 | 10,808 | +39.06 |
| Replacement | 45,934 | 40,386 | +13.74 |
| Radial | 35,742 | 27,490 | +30.02 |
| Export | 2,140 | 1,262 | +69.57 |
| Radial | 1,611 | 816 | + 97.43 |
| Total | 66,074 | 54,572 | +21.08 |
| Radial | 52,383 | 39,114 | +33.92 |
| Production | 58,392 | 53,641 | + 8.86 |
| Radial | 43,127 | 37,472 | +15.09 |
| Ending Inventory | 31,118 | 42,810 | −27.31 |
| Radial | 22,048 | 32,743 | −32.66 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 2,562 | 1,610 | +59.13 |
| Radial | 1,327 | 784 | +69.26 |
| Replacement | 9,665 | 8,446 | +14.43 |
| Radial | 3,421 | 2,586 | +32.29 |
| Export | 453 | 328 | +38.11 |
| Radial | 221 | 142 | +55.63 |
| Total | 12,680 | 10,384 | +22.11 |
| Radial | 4,969 | 3,512 | +41.49 |
| Production | 11,962 | 10,552 | +13.36 |
| Radial | 4,354 | 3,339 | +30.40 |
| Ending Inventory | 6,908 | 9,111 | −24.18 |
| Radial | 2,761 | 4,104 | −32.72 |

**Pennsylvania Glass Sand Corp.** is undertaking a $6.6 million modernization and expansion program at four of its six ground silica plants. Combined capacity for the specialty products after the completion of the expansion program will exceed one million tons per year.

## Contracts, licenses

The Materials, Chemicals and Vehicle Requirements Board of the U.K. Department of Trade and Industry has contracted to make £540,000 available to support the work carried out within the Members Program of research and development at the **Rubber and Plastics Research Association**. Payments by the board will be matched by contributions from RAPRA members and from the association's funds to bring the total value to over £1 million.

**Kent Manufacturing Co.**, Grand Rapids, MI will handle the sales of **Roger Corp.'s** cellular urethane industrial products in Western Michigan.

**Littleford Bros. Inc.** named **Landcaster Corp.**, Baton Rouge, LA, as sales representatives in southern Louisiana and southeast Texas for its line of "Aer-O-Tek" material nadling equipment.

**L.V. Lomas Chemical Co.**, Mississauga, Ontario was named full lime stocking distributor for **Solem Industries'** alumina trihydrate.

## Financial statements

**Alliance Tire and Rubber** of Israel reported consolidated net sales for 1983 were IS. 5.4 million with a loss in earnings of IS. 539.3 million.

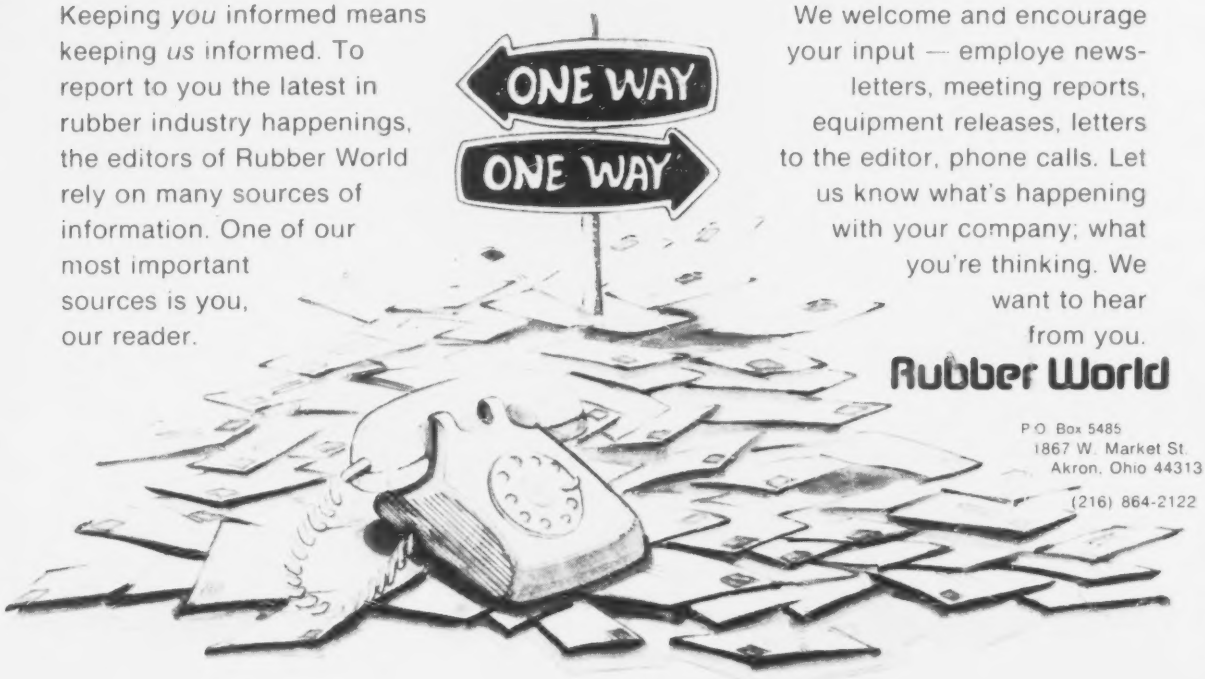
**Blasius Industries** reported fiscal 1984 net earnings of $1.7 million on sales of $42.7 million.

**Brad Ragan, Inc.** reported revenues of $178.8 million and net income of $1.6 million for fiscal 1984.

**Eagle-Picher Industries** had second quarter earnings of


# It's a two-way street

Keeping *you* informed means keeping *us* informed. To report to you the latest in rubber industry happenings, the editors of Rubber World rely on many sources of information. One of our most important sources is you, our reader.




We welcome and encourage your input — employe newsletters, meeting reports, equipment releases, letters to the editor, phone calls. Let us know what's happening with your company; what you're thinking. We want to hear from you.

**Rubber World**

P.O. Box 5485
1867 W. Market St.
Akron, Ohio 44313
(216) 864-2122

$17.1 million on sales of pf $180.9 million.

**GenCorp** posted net earnings of $22.3 million for the second quarter on sales of $594.4 million.

**Rubbermaid Inc.** reported net sales for the second quarter were $119 million and net earnings were $9 million.

## Markets, news

First quarter production of furnace black increased 20% and shipments 16% from the same period of 1983 to 323 thousand metric tons each, according to Columbian Chemicals. This was the highest production in three years and the highest shipments since the fourth quarter of 1980. Demand in all grades was up, with N-600 the strongest in four years and N-300 the highest in three years. Plant inventories of 68 MMT represented less than a three week supply based on first quarter 1984 shipments.

Paralleling the carbon black industry performance, U.S.A. dry rubber hydrocarbon consumption rose to the highest level since the second quarter of 1979. Totaling 708 thousand metric tons, this was 27% over the year ago level, Columbian reports. All polymers were up, with EPDM having a record quarter and Natural Rubber the highest since the second quarter of 1977. Both rubber ratios were lower than 1983. The synthetic share declined from 73.1% to 71.4% and carbon black from 49.4 to 44.8 parts per hundred rubber.

The BFGoodrich company has announced that it is renewing its membership in the International Institute of Synthetic Rubber Producers (IISRP). "We elected to withdraw as members of IISRP three years ago during a period of intensive evaluation and analysis of the synthetic rubber business," said Kendall Greene, vice president and general manager of the Ameripol SBR Division. Greene noted that the SBR division has made a transition from the Chemical Group to the Tire Group, including a physical move of personnel from Independence, Ohio to the BFGoodrich World Headquarters complex in Akron, Ohio. "To better serve the needs of our SBR customers, we established a separate sales force and sales service group," he said. "Our combined marketing, sales, R&D, purchasing and production capabilities are directed toward the important general purpose rubber markets served by SBR," he said. He noted that the capital improvement program at the division's Port Neches, Texas, plant has been significantly increased.

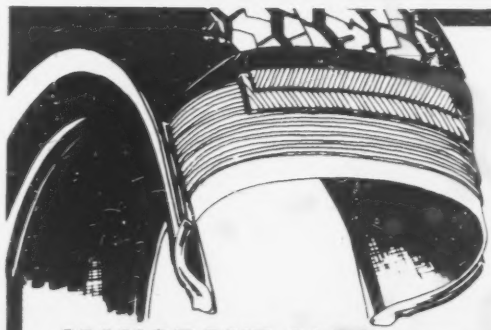
"Our decision to rejoin the IISRP is based on the substantial productivity gains we have made and our long-term commitment to the general purpose SBR business," said Greene. "As we have done in the past, we expect to be an active participant in Institute activities and look forward to renewing our relationships with the Institute and its other members."

The U.S. Department of Commerce's 1982 Census of Manufacturers of the rubber and plastics hose and belting industry shows employment at 24,700,a 28% decrease from the last census in 1977. The figure is 8% less compared to 1981 data based on a sample survey. The total value of shipments in this industry was $1,958 million. The quantities of the materials consumed by this industry dropped in all instances from the 1977 figures. SBR is the most consumed material at 65.1 million pounds followed by ethylene-propylene at 43.1 m/lbs., reclaimed rubber 28.5 m/lbs., polychloroprene 28.1 m/lbs. and nitrile 22.5 m/lbs.

**Carbon black industry in the U.S.A.**
**(Metric Tons)**

| | | | Percentage Change from | |
|---|---|---|---|---|
| | | 1st Qtr. 1984 | 4th Qtr. 1983 | 1st Qtr. 1983 |
| N-100 (SAF) | Prod. | 6,037 | ( 4.5%) | +14.9% |
| | Ship. | 6,362 | ( 6.5%) | +21.2% |
| N-200 (ISAF) | Prod. | 35,426 | ( 7.6%) | +34.2% |
| | Ship. | 36,629 | ( 3.1%) | +28.3% |
| N-300 (HAF) | Prod. | 142,365 | +13.0% | +15.6% |
| | Ship. | 137,868 | + 5.8% | +12.2% |
| N-500 (FEF) | Prod. | 28,475 | +14.9% | +31.2% |
| | Ship. | 28,527 | +11.4% | +16.0% |
| N-600 (GPF) | Prod. | 80,638 | + 2.1% | +17.5% |
| | Ship. | 81,539 | + 1.7% | +15.6% |
| N-700 (SRF) | Prod. | 29,889 | ( 6.1%) | +22.6% |
| | Ship. | 31,754 | (10.8%) | +15.0% |
| Total | Prod. | 322,830 | + 5.4% | +19.8% |
| | Ship. | 322,679 | + 2.0% | +15.5% |
| Domestic Shipments (Included Above) | | 316,965 | + 2.1% | +15.6% |
| Domestic Share | | 98.2% | | |

The United Rubber Workers said it considers Korean tire imports injurious to the U.S. tire industry and that it is "fully supportive of the anit-dumping petition recently filed by the industry against radial passenger tires imported from South Korea," according to Milan Stone, URW International president. "The URW has been seriously concerned about imported tires for many years because increased imports mean fewer jobs for American workers," he said "This isn't good for the tire industry nor is it good for the American economy." Korean imports have increased their share of a growing market by using unfair pricing methods, according to the petition.

**MANOBOND 680C improves humidity resistance and adhesion retention in steel-belted radials.**

Manobond 680C, a 23% cobalt bonding agent in pastille form, has been developed to provide high humidity resistance and increased adhesion retention in steel belted radial tires and reinforced conveyor belting. It is especially effective when bonding polymers including NR, SBR, and BR to steel cord substrates such as brass, zinc and bare steel.

Manobond 680C also reduces environmental hazards associated with heavy metal dust, permits automatic weighing, improves weighing accuracy, and reduces waste.

Compare MANOBOND 680C with the cobalt system you're presently using. Send or call for samples and technical data today.

**MANCHEM, INC.**

U.S./CANADIAN SALES OFFICE
77 Maple Drive, Hudson, Ohio 44236 • (216) 650-0082

Circle 7 on card

# Exciting growth ahead for the adhesive and sealant industry

*by William R. Schmitz*

The adhesive and sealant industry has, for many years, been characterized by high sales growth and, in this regard, compares very favorably with many of our important industries. Adhesives and sealants are used in virtually every major market — most notably in packaging, housing and construction, automotive and aerospace, furniture, electronics, appliances, bookbindings, shoes and apparel, and the "do-it-yourself" consumer market.

Since our products must be formulated to meet a vast range of conditions and specifications, the industry is highly diverse and technologically complex. As such, it remains a mystery to many of our consuming publics. In addition, since successful marketing so often is dependent upon a company's formulating skills and ability to work closely with the consumer, many companies tend to minimize the advertising resource and, instead, favor the one-to-one selling and service approach — and thus perpetuate a limited appreciation of the scope of the industry.

Manufacturers of adhesives and sealants have long recognized the unlimited potential for their products and have emphasized research and development to add to their technology base and yield improved, more sophisticated products for existing and emerging markets. Today adhesives and sealants play a key role in improving productivity and reducing energy consumption as they steadily replace traditional methods of fastening and joining.

New engineering adhesives and sealants — as exemplified by self crosslinking acrylics, epoxies, silicones, cyanoacrylates, anerobics, and urethanes — are all in an increasing sales trend because of their unique properties and their ability to fulfill more difficult bonding requirements. No doubt in the years ahead we will find that old-style mechanical fasteners will be largely replaced by synthetic adhesives.

Rubber-based products continue to play an important role in a number of product lines offered by adhesive and sealant manufacturers. Although the need to include solvents has caused the formulator to modify formulations in order to comply with existing government regulations, properties that still can only be obtained through rubber solvent systems suggest that for the near term and probably long term as well, rubberbased adhesives and sealants will continue to play an important part in this industry's product lines.

Today's adhesive and sealant industry is made up of a number of large companies that include Avery International, H.B. Fuller, Ashland Chemical, Loctite, National Starch and Chemical, Products Research and Chemical,

**Adhesives and sealants (SIC 2891): trends and projections 1972-84**
(in millions of dollars except as noted)

| Item | 1972 | 1977 | 1979 | 1981 | 1982[1] | 1983[2] | Compound annual rate of growth 1972-83 | 1984[3] | Percent change 1983-84 |
|---|---|---|---|---|---|---|---|---|---|
| **Industry data** | | | | | | | | | |
| Value of shipments[4] | 928.0 | 1,813.1 | 2,340.8 | 2,707.8 | 2,600.0 | 2,910.0 | 10.9 | — | — |
| Value of shipments (1972$)[4] | 928.0 | 1,159.3 | 1,373.4 | 1,131.1 | 1,035.0 | 1,145.0 | 1.9 | 1,225.0 | 7.0 |
| Total employment (000) | 14.9 | 16.7 | 17.8 | 17.0 | 16.4 | 15.8 | 0.5 | 16.0 | 1.3 |
| Production workers (000) | 8.5 | 10.2 | 10.1 | 10.3 | 9.7 | 9.3 | 0.8 | 9.5 | 2.2 |
| Average hourly earnings of production workers ($) | 3.91 | 5.51 | 6.11 | 7.34 | 8.02 | 8.42 | 7.2 | — | — |
| Capital expenditures | 24.9 | 39.0 | 62.9 | 73.7 | — | — | — | — | — |
| **Product data** | | | | | | | | | |
| Value of shipments[5] | 954.2 | 1,873.1 | 2,366.3 | 2,745.0 | 2,660.0 | 2,970.0 | 10.9 | — | — |
| Value of shipments (1972$)[5] | 954.2 | 1,197.6 | 1,388.7 | 1,146.6 | 1,170.0 | 1.9 | 1,255.0 | 7.3 | |
| Product price index (1972 = 100) | 100.0 | 156.3 | 170.5 | 239.3 | 262.8 | 254.0 | 8.8 | — | — |
| **Trade** | | | | | | | | | |
| Value of exports | 32.1 | 102.0 | 96.2 | 118.0 | 87.4 | 84.0 | 9.1 | 90.0 | 7.1 |
| Value of imports | 24.5 | 52.2 | 32.6 | 40.7 | 36.9 | 40.0 | 4.6 | 42.0 | 5.0 |
| Import/shipments ratio | 0.039 | 0.069 | 0.052 | 0.057 | 0.033 | 0.028 | — | — | — |
| Import/new supply ratio[6] | 0.108 | 0.123 | 0.072 | 0.082 | 0.014 | 0.013 | — | — | — |

[1]Estimated except for product price index, exports, and imports.
[2]Estimated.
[3]Forecast.
[4]Value of all products and service sold by industry SIC 2891.
[5]Value of shipments of Adhesives and sealants products produced by all industries.
[6]New supply is the sum of product shipments plus imports.
Source: Bureau of the Census and Bureau of Industrial Economics. Estimates and forecasts by the Bureau of Industrial Economics.

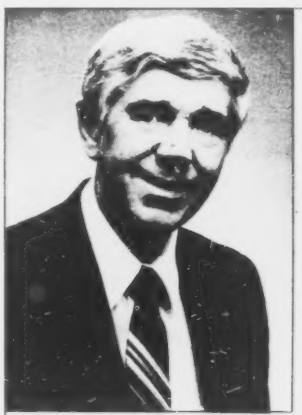
and 3M. In addition to these leading companies and others of their size, are many medium-size and small companies. Although a fair percentage are still family owned and operated, over the past 20 years there has been a shift towards reliance upon professional management to realize company growth and profit. In recent years, many companies have recognized the significant opportunities for marketing their products to industrial nations and developing countries, and I foresee this trend increasing in the years ahead. And I am confident that the research now underway will yield new products and will further propel the industry in new directions.

As the industry has matured, management came to realize that a number of important industry problems could best be addressed through a collective effort. The industry took an important first step this year by supporting a program that will help bring industry and academia closer together.

Through a Pilot Education Program sponsored by The Adhesive and Sealant Council, we will be funding fellowships at the graduate level and scholarships at the undergraduate level at three universities: the University of Connecticut, the University of Akron, and the University of Southern California.

The Pilot Education Program has been organized by the Council to develop a closer working partnership with academia that can result in adding to the technology base and attracting superior students to the adhesive and sealant industry where opportunities for advancement are equal to any of the nation's "growth" industries. A closer relationship with academia also can provide continuing education opportunities for the industry's personnel and lead to the establishment of a Center funded by an ASC Education Foundation.

I have been fortunate to have been associated with the adhesive and sealant industry during the past 13 years. I have witnessed the remarkable growth which has occurred and shared the excitement felt by so many who are a part of this fascinating industry. Future changes in adhesive/sealant formulating technology coupled with new market penetrations should keep our industry growing for many years to come.



William R. Schmitz

*William R. Schmitz, President of The Adhesive and Sealant Council Inc., Arlington, Va. is employed by Ashland Chemical Co. as Business Manager of the Adhesive & Sealant operations at its Ashland, Ohio facility. Schmitz, who attended Texas A&M University, has been associated with the adhesive and sealant industry for the past 13 years.*

## Glossary of adhesive literature

*The following glossary of books relating to adhesion was compiled from the catalog of the Rubber Division Library. The books are available for interlibrary loan and can be obtained by contacting Ruth Murray, Information Specialist, ACS Rubber Division Library, The University of Akron, Akron, Ohio, 44325, (216) 375-7197.*

**Adhesion.** Vol. 1-7. London: Applied Science Publishers, 1977-1983.

**Adhesion: Fundamentals and Practice:** A Report of an International Conference held at the University of Nottingham, England, 20-22 September 1966 by the Ministry of Technology (United Kingdom). New York: Gordon and Breach, 1969.

Allen, K.W. (ed.). **Adhesion 8.** London: Elsevier Applied Science Publishers, 1984.

**Aspects of Adhesion.** London: University of London Press, 1963.

Buckley, Donald H. **Surface Effects in Adhesion, Friction, Wear, and Lubrication.** New York: Elsevier Scientific Publishing Co., 1981.

Caro, Elias. **Adhesion Studies on Block Copolymers.** Akron: University of Akron, 1975.

Chang, Rong-Jong. **Effect of Interfacial Bonding on the Strength of Adhesion Between Elastomer Layers.** Akron: University of Akron, 1981.

Chu, Kwang-Ho. **The Effect of Silane Coupling Agents on Cord Adhesion.** Akron: University of Akron, 1977.

**Contact Angle, Wettability, and Adhesion:** the Kendall award symposium honoring William A. Zisman, Los Angeles, Calif., April 2-3, 1963. Washington: American Chemical Society, 1964.

DeBruyne, N.A., Houwink, R. and Salomon, G. (eds.). **Adhesion and Adhesives.** New York: Elsevier Publishing Co., 1965.

Deryagon, B.V., Krotova, N.A. and Smilga, V.P. **Adhesion of Solids:** translated from Russian by Robert K. Johnson. New York: Consultants Bureau, 1978.

Drobny, Jiri. **Autohesion of a Butadiene-Styrene Copolymer.** Akron: University of Akron, 1971.

Hamed, Gary. **Peel Mechanics and the Adhesion of Triblock Copolymers.** Akron: University of Akron, 1978.

Hsu, Chih-Chung. **Self-adhesion of Crosslinked Elastomers.** Akron: University of Akron. 1979.

Jimenez, Rafael. **Adhesion and Bonding Between Glassy Polymers.** Akron: University of Akron, 1979.

Kaelble, D.H. **Physical Chemistry of Adhesion.** New York: Wiley-Interscience, 1971.

Lee, Lieng-Huang (ed.) **Adhesion and Adsorption of Polymers:** International Conference on Adhesion and Adsorption of Polymers, Honolulu, 1979. New York: Plenum Press, 1980.

Lee, Lieng-Huang (ed.). **Adhesion Science and Technology:** Macromolecular Symposium on Science and Technology of Adhesion, Philadelphia, 1975. New York: Plenum Press, 1975.

Lee, Lieng-Huang (ed.). **Recent Advances in Adhesion:** ACS Symposium on Recent Advances in Adhesion, Washington, D.C., 1971. New York: Gordon and Breach Science Publishers, 1973.

Liu, Richard W. **Fatigue Strength of Autohesive Bonds.** Akron: University of Akron, 1975.

Mittal, K.L. (ed.). **Adhesion Aspects of Polymeric Coatings:** Symposium on Adhesion Aspects of Polymeric Coatings, Minneapolis, Minn., 1981. New York: Plenum Press, 1983.

Padday, J.F. (ed.). **Wetting, Spreading, and Adhesion:** Symposium by the Colloid and Surface Chemistry Group of the Society of Chemical Industry, held on 27-29 September 1976 at Loughborough University, Leicestershire. New York: Academic Press, 1978.

*(continued on page 39)*

# NOTE

ONLY THE FOLLOWING PAGES OF THIS

PUBLICATION HAVE BEEN FILMED

Cov. 1, p. 2, 12-13.

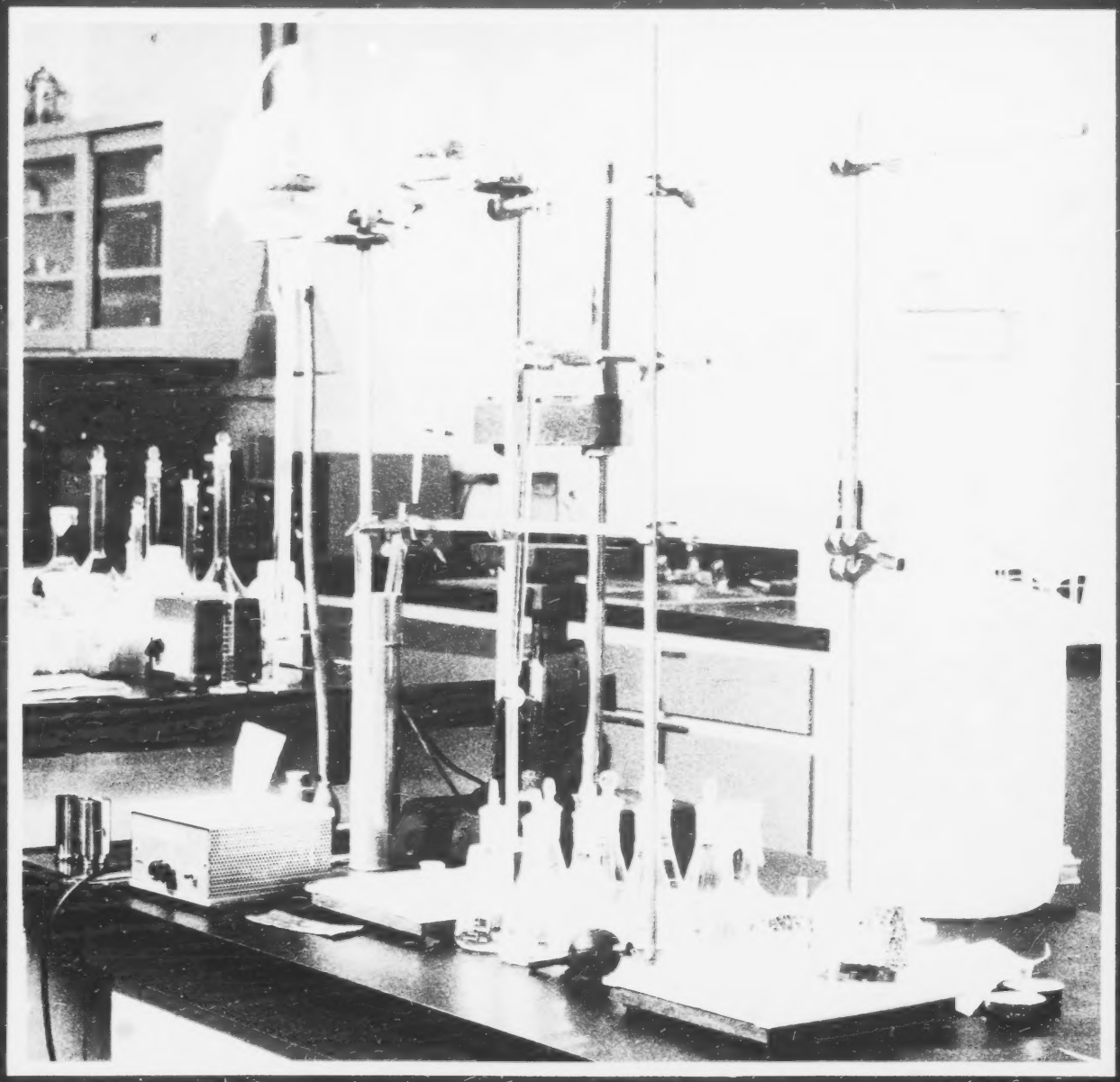
# Rubber World

The technical service magazine for the rubber industry

Volume 190, No. 6

September 1984

## Using lab instruments in failure analysis



Compounding fluoroelastomers for resistance to extrusion at high temperature, pressure

Rubber Division fall meeting schedule

Compounding ingredients price list

Factors of mechanical design

# Rubber World

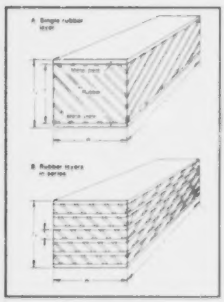
**The technical service magazine for the rubber industry**

Failure analysis p. 18


**11 Business Briefs**
Acquisitions, expansions; contracts, licenses; financial statements; price changes; markets, news.

**12 Tech Service — Backrinding: an old problem that's still with us**
by Jon Menough, contributing technical service editor. A look at the causes of this molding problem and some ways of correcting the problem.

**18 Use of laboratory instruments in failure analysis**
by Jerry J. Leyden, Smithers Scientific Services. Article examines the concept of failure analysis and where lab instrumentation fits into this analysis. The proper steps which should be taken in a failure analysis investigation are also discussed.

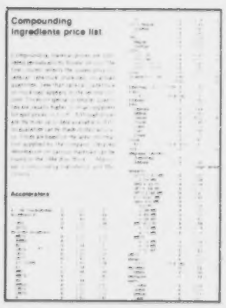
Mechanical design p. 23


**23 Factors of mechanical design**
by Roy L. Orndorff, Jr. The BFGoodrich Co. Author explains important aspects of rubber engineering dealing with impact absorption, energy storage and isolating vibration or noise. Describes three types of engineered distortion of rubber and provides examples of good design.

**31 Compounding fluoroelastomers for resistance to extrusion at high temperatures and pressures**
by Ronald D. Stevens, E.I. du Pont de Nemours & Co. Article examines why fluoroelastomers resist extrusion at high temperatures and pressures and develops some guidelines for oil field compounders to use in formulating functional fluoroelastomer stocks.

**38 New Patents**
edited by Bob Samples, Akron Rubber Development

**45 Techno Mart**
edited by David Given, technical editor


Price list p. 53


**53 Compounding Ingredients Price List**
*Rubber World's* semi-annual compilation of prices of chemicals and materials used in the rubber industry.


## Departments


| | | | |
|---|---|---|---|
| 4 | Editorial | 67 | Jobs & People |
| 8 | Mailbag | 70 | Literature |
| 39 | Meetings | 72 | Advertisers Index |


## Cover

**Cover photo courtesy of Smithers Scientific Services.**


A Lippincott & Peto Publication/Volume 190, No. 6/September 1984

distributor and agent in North America.

**Gates Energy Products** signed a distributorship agreement with **Bridgestone** to sell "Cyclon" rechargeable batteries in Japan.

**Polymer Concepts Inc.** was appointed sales representative for **Metachem Corp.'s** Mereco Divisions in the states of North Carolina, South Carolina, and the southern part of Virginia.

## Financial Statements

**AccuRay Corp.** reported net income of $1.548 million in the second quarter on total operating revenues of $31.8 million.

**Alliance Tire and Rubber** announced that consolidated net sales for the first quarter were IS. 3,188 billion and that consolidated net loss was IS. 106.23 million.

**American Biltrite** reported net earnings for the second quarter of $1.037 million on sales of $22.012 million.

**Armstrong Rubber** announced that third quarter net sales of $179.6 million produced net income of $6.7 million.

**The Biltrite Corp.** reported second quarter net earnings of $581,000 on sales of $18.121 million.

**Bridgestone Corp.** announced that it earned $35 million during the first six months of this year, with sales of $1,117 million during the period.

**Carlisle Corp.** reported net earnings of $8.031 million for the second quarter on net sales of $131.282 million.

**Compo Industries'** net income for its third quarter was $726,000, with consolidated revenues of $40.455 million.

**RMA monthly tire & tube shipments & production report through June 1984 (figures in thousands of units)**

| Passenger Tires | 1984 | 1983 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 22,570 | 16,596 | +36.00 |
| Radial | 18,845 | 13,847 | +36.09 |
| Replacement | 58,532 | 53,035 | +10.36 |
| Radial | 45,043 | 36,131 | +24.67 |
| Export | 2,659 | 1,589 | +67.34 |
| Radial | 1,977 | 1,056 | + 87.22 |
| Total | 83,761 | 71,220 | +17.61 |
| Radial | 65,865 | 51,034 | +29.06 |
| Production | 73,126 | 65,995 | +10.81 |
| Radial | 54,140 | 45,813 | +18.18 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 3,288 | 2,030 | +61.97 |
| Radial | 1,692 | 943 | +79.43 |
| Replacement | 12,272 | 10,797 | +13.66 |
| Radial | 4,246 | 3,422 | +24.08 |
| Export | 560 | 420 | +33.33 |
| Radial | 273 | 187 | +45.99 |
| Total | 16,120 | 13,247 | +21.69 |
| Radial | 6,211 | 4,552 | +36.45 |
| Production | 15,272 | 12,732 | +19.95 |
| Radial | 5,792 | 3,833 | +51.11 |

**Cooper Tire & Rubber** reported second quarter net income of $6.4 million on sales of $147.6 million.

**Crompton & Knowles** announced that its second quarter net earnings were $2,366 on net sales of $62,550.

**Essex Chemical** said that its second quarter net profit totaled $3.318 million on sales of $56.987 million.

**Freeport-McMoRan** gave its second quarter net income as $25.857 million, with total revenues of $217.7 million.

**BFGoodrich** reported second-quarter net income of $32.4 million on sales of $883.4 million.

**Goodyear** had a worldwide second quarter net income of $108.6 million, with worldwide sales reaching $2.64 billion.

**Lydall, Inc.** announced second quarter earnings of $1.7 million on sales of $34.7 million.

**Jones & Vining** has second quarter net earnings of $688,000 on sales of $9.698 million.

**Lubrizol** reported that its net income for the second quarter was $21.618 million while revenues were $225.627 million during the period.

**Myers Industries** said that its second quarter net sales rose to $22.6 million, producing a net income for the period of $843,000.

**Park-Ohio** reports that its net sales reached $49.291 million in the second quarter and that net income rose to $1.102 million.

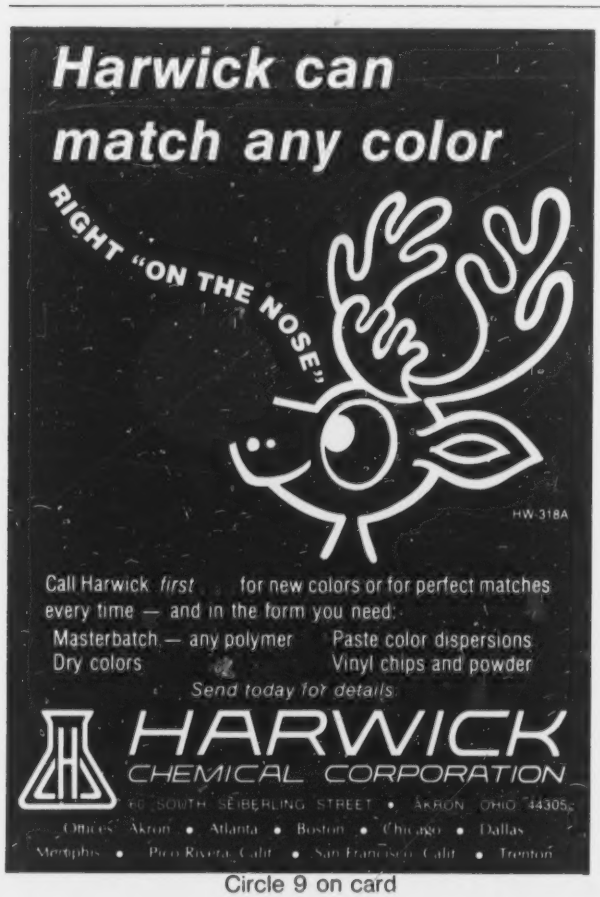
**Pfizer** reported second quarter net income of $118.1 million on sales of $985.7 million.

**Sheller-Globe** reported that its third quarter earnings were $11.1 million on sales of $217.5 million.

**The Standard Products Co.** reported that its net income for the fiscal year ending June 30, 1984 increased to $22.214 million and that its sales for the year reached $326.316 million.

**Sybron Corporation** has second quarter earnings of $3.788 million on sales of $149.232 million.

**Uniroyal** reported that its second quarter net income reached $30.2 million with sales of $615 million.



Harwick can match any color
RIGHT "ON THE NOSE"
HW-318A
Call Harwick first for new colors or for perfect matches every time — and in the form you need:
Masterbatch — any polymer
Paste color dispersions
Dry colors
Vinyl chips and powder
Send today for details
HARWICK
CHEMICAL CORPORATION
60 SOUTH SEIBERLING STREET • AKRON, OHIO 44305
Offices: Akron • Atlanta • Boston • Chicago • Dallas
Memphis • Pico Rivera, Calif. • San Francisco, Calif. • Trenton
Circle 9 on card

## Markets, news

Footwear imported into the United States increased for the sixth month in a row according to the Commerce Department with June imports 29% higher than a year ago. George Langstaff, president of the Footwear Industries of America said imports have captured well over 70% of the domestic market and since the International Trade Commission's June ruling that the domestic footwear industry was not being injured by imports, nine shoe factories have shut down, bringing the total to 32 factory shutdowns for 1984.

The ITC's first quarter report shows the U.S. footwear trade deficit amounted to $1.2 billion in the first quarter of 1984, a 23% increase over the same period of 1983. Imports increased 22% and exports declined 8% during the period. Total imports of rubber footwear increased by 6%.

The ITC also reported that imports of passenger tires increased 50% to 7.2 million tires, imports of elastomers increased 44% to 637.2 million pounds, exports of elastomers increased 17% to 196.8 million pounds and imports of molding and forming machines increased 108% to $76 million for the first quarter of the year.

Dunlop Tire was erroneously named as an importer of Korean-made passenger tires in the anti-dumping petition filed by five other U.S. tire manufacturers. Randall Clark, tire division president of Dunlop said "Dunlop supports the action of the five other tire manufacturers in this matter and we anticipate submitting a response to the petition voicing our support."

World tire markets will grow at a compound rate of 3.4% per year for the rest of the decade according to Allied Fibers' H. H. Rowan. By 1990, North American passenger tire output will be 85% radial which will prove a bonanza for steel cord over this period. Rowan forecasts that the world's steel tire cord consumption will rise about 50% to around 500 million lbs. in 1990.

A study commissioned by the Chemical Manufacturers Association concludes DEHP is safe for use in toys and other products for children. The report said that di-2-ethylexyl phthalate (DEHP), a PVC plasticizer, is metabolized differently in humans than mice or rats. An earlier study showed DEHP caused liver tumors in rats and mice when fed high dosages of the plasticizer.

**RMA industry rubber report through May 1984 (figures are expressed in metric tons)**

| | Cumulative 1984 | Cumulative 1983 | % Change 84 vs. 83 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 1,398,364 | 1,161,885 | 20.35 |
| Imports | 467,149 | 351,031 | 33.89 |
| Exports | 152,373 | 132,624 | 14.89 |
| Apparent Consumption | 1,213,356 | 1,008,522 | 20.31 |
| **Total Natural Rubber** | | | |
| Imports | 366,323 | 288,848 | 26.82 |
| Exports | 9,846 | 7,706 | 27.77 |
| Apparent Consumption | 346,180 | 276,484 | 25.21 |
| % Total new rubber | 28.53 | 27.41 | |
| **Total Synthetic Rubber** | | | |
| Production | 931,215 | 810,854 | 14.84 |
| Imports | 100,826 | 62,183 | 62.14 |
| Exports | 142,527 | 124,918 | 14.10 |
| Apparent Consumption | 867,175 | 732,038 | 18.46 |
| **Total SBR** | | | |
| Production | 424,462 | 374,228 | 13.42 |
| Imports | 30,285 | 21,634 | 39.99 |
| Exports | 42,746 | 35,662 | 19.86 |
| Apparent Consumption | 393,717 | 361,338 | 8.96 |
| **Total Nitrile** | | | |
| Production | 28,157 | 21,935 | 28.37 |
| Imports | 4,825 | 3,351 | 43.99 |
| Exports | 3,156 | 2,526 | 24.94 |
| Apparent Consumption | 39,384 | 22,262 | 35.01 |
| **Polybutadiene** | | | |
| Production | 151,359 | 135,189 | 11.96 |
| Imports | 28,828 | 14,853 | 100.82 |
| Exports | 10,322 | 6,396 | 61.38 |
| Apparent Consumption | 170,010 | 139,516 | 21.86 |
| **Ethylene-Propylene** | | | |
| Production | 93,948 | 68,687 | 36.78 |
| Imports | 270 | 77 | 250.65 |
| Exports | 15,386 | 13,425 | 14.61 |
| Apparent Consumption | 74,120 | 54,808 | 35.24 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 182,034 | 157,935 | 15.43 |
| Imports | 33,871 | 21,201 | 59.76 |
| Exports | 54,480 | 46,064 | 18.27 |
| Apparent Consumption | 160,294 | 123,030 | 30.29 |
| **Polychloroprene** | | | |
| Production | 50,986 | 52,880 | −3.58 |
| Imports | 1,747 | 1,067 | 63.73 |
| Exports | 16,437 | 20,845 | −21.15 |
| Apparent Consumption | 39,653 | 31,086 | 27.56 |

USE RUBBER WORLD READER SERVICE CARDS FOR INFORMATION ON

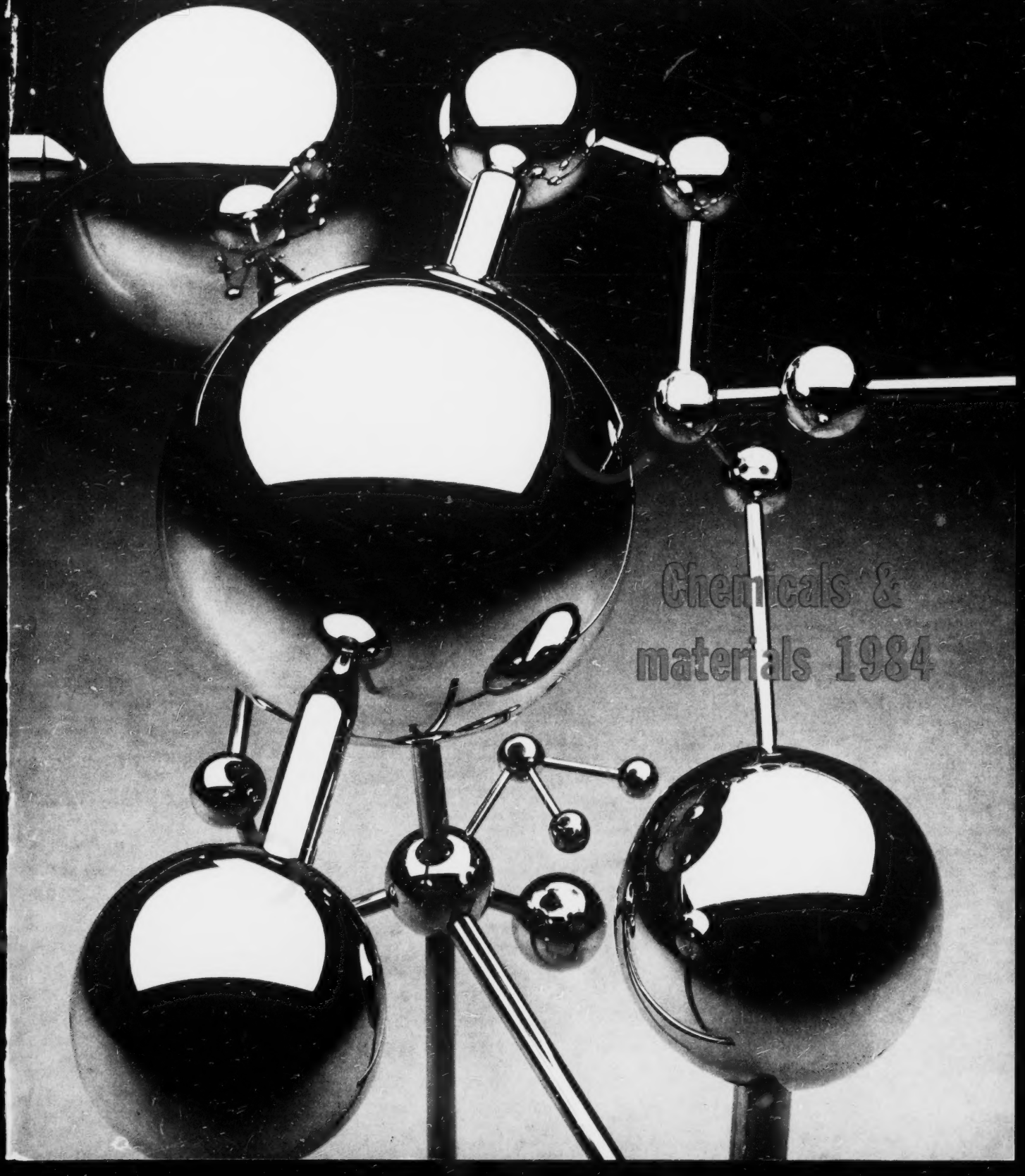
- ADVERTISEMENTS
- PRODUCTS
- LITERATURE

# Rubber World

The technical service magazine for the rubber industry

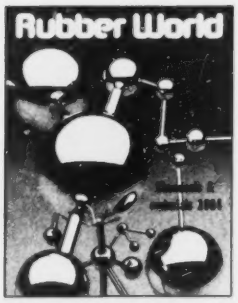
Volume 191, No. 1

October 1984



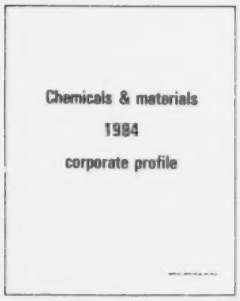
# Contents

Vol. 191, No. 1/October 1984




Chemicals, materials outlook p. 17

Polymer bound rubber chemicals p. 24




Corporate profile p. 57


**7 Business Briefs**
Acquisitions, expansions; contracts, licenses; financial statements; price changes; markets, news.

**14 Tech Service — Reviewing an age old problem**
*by Jon Menough, contributing technical service editor.* As chemists and compounders attempt to extend the useful life of products more concern is needed with protection from aging.

**17 Brighter days for chemicals, materials**
*by Don R. Smith, managing editor.* Although production and sales of chemicals and materials haven't reached any records recently, the markets are much stronger than during the last two years.

**24 Polymer-bound rubber chemicals — some aspects of optimized polymer binders**
*by Helfried Ehrend and Klaus Morche, Rhein-Chemie/Mobay Chemical Corp.* These chemicals offer protection against dusting while offering good dispersibility.

**32 Vulcanization of natural rubber in the presence of amides of fatty acids and rosin**
*by N.B. Fegade, N.M. Deshpande and W. Millns, Indian Rubber Manufacturers Association.* Authors present findings on studies of the effectiveness of amides of fatty acids and rosin as co-activators for thiazole accelerated sulfur vulcanization of natural rubber in the absence of stearic acid.

**39 Predicting the long term compression set of elastomers**
*by Raymond Sprey, Disogrin Industries.* Discussed is method for estimating the long term compression set of a material based upon short term stress-relaxation data suitable for many small laboratories.

**44 Product developments and customer requirements combine to expand the markets for silicone rubber**
*by Milton C. Murray, Dow Corning.* The markets for fabricated silicone rubber parts has greatly expanded and author looks at new applications and reasons for expanded use.

**49 New Patents**
edited by Bob Samples, Akron Rubber Development.

**57 Chemicals and materials Corporate Profile '84**

**99 Technical Focus**
*by David Given, technical editor.* A look at new programs designed for the rubber industry.

**101 Techno Mart**
New equipment, instrumentation, CAD/CAM, products, materials.


## Departments


4 Editorial
6 Mailbag
50 Meetings
55 Calendar
109 Jobs & People
111 Literature


## Cover

**Cover photo courtesy of Allied Chemical**

A Lippincott & Peto Publication

# Business Briefs

Louis, MO, a distributor of less than truckload quantities of its zinc oxide.

**Sylacauga Calcium Products** appointed **Seegott, Inc.**, Parsippany, NJ as a distributor for calcium products and **G-3 Industries**, Grand Junction, CO as distributors for calcium carbonate products.

**Union Process** named **Firing Industries**, Niagara-on-the-Lake, Ontario as a distributor and sales representative for processing equipment for fine particle grinding and dispersion.

**Littleford Bros.** named **Southern Engineering Sales**, Tallahasee, FL, **Process Equipment Sales**, Cherry Hill, NJ and **Lawson Technologists**, Cranford, NJ as manufacturing rep organizations representing Littleford's "Aer-O-Tek" material handling equipment.

**Wilmington Chemical Corp.** appointed the **J.D. Mullen Co.**, Denver, CO, as exclusive sales agent for its polyurethane dispersions.

**Lubrizol Corp.** established a partnership with **Intera Corp.**, Cleveland, TN to market the technology and chemicals developed by Intera which provide synthetic fibers with the permanent absorbency and comfort of natural fibers.

## Financial statements

**Blasius Industries** reported 1984 net sales amounted to $42.7 million with net earnings of $1.78 million.

**Brad Ragan, Inc.** had first quarter revenues of $51 million and net income of $716,000.

**Cabot Corp.** reported net income for the third quarter was $26.49 million on sales of $468.2 million.

**Carlisle Corp.'s** second quarter net earnings were $8 million on sales of $131.2 million.

**Compo** reported third quarter revenues were $40.4 million and net income was $726,000.

**Dayco Corp.** had third quarter sales of $226.4 million and earnings of $3.3 million.

**Exxon** reported that worldwide chemicals earnings were $256 million in the first six months of 1984 and sales volumes were up 18%.

**Firestone** reported income for the quarter of $29 million on sales of $1 billion.

**Jones & Vining** reported second quarter net earnings of $688,000 on sales of $9.69 million.

**Myers Industries** had second quarter sales of $22.6 million and net income of $843,000.

**Petrolane Inc.** reported a loss for the quarter of $5.9 million. Sales were $210 million.

**Rubbermaid's** second quarter earnings were $9 million on sales of $119 million.

## Price changes

**Uniroyal** increased the price for antiozonants, accelerators, antioxidants, chemical bonding agents and curatives an average 10-15¢.

**SCM Specialty Chemicals** announced a 10% price increase on Prosil organofunctional silanes.

**Hercules** made these price changes: increased the base prices for most types of its "Parlon" chlorinated rubber by 8¢/lb.; increased the price of its mixed-acid emulsifier Resin 3072 2¢/lb.; raised the price of Hercolube 202 by 5¢/lb.; Hercoflex 600 increases 5¢/lb.; Hercoflex 707 increases 10¢/lb.; Hercoflex 707A rises 5¢/lb.; Hercoflex 707/707A goes up 7.5¢/lb.; soluble grades of nitocellulose increase 8¢/lb.

**SWS Silicones** increased the price of selected specialty, functional fluid and emulsion silicone products approximately 5%.

**Degussa AG** increased the price of pentaerythritol to at least GM 3.30 per kg.

**Akzo Chemie America-Noury Chemical's** new per pound prices for selected organic peroxides are: Perkadox 16/35- $4.24; 16-W40- $4.47; 16-W70- $7.44; Cadox TS-50- $14.31; Cadox BS- $7.42.

**RMA industry rubber report through June 1984**
**(figures are expressed in metric tons)**

| | Cumulative 1984 | Cumulative 1983 | % Change 84 vs 83 |
|---|---|---|---|
| **Total New Rubber** | | | |
| New rubber available | 1,640,496 | 1,406,739 | 16.62 |
| Imports | 525,618 | 431,337 | 21.86 |
| Exports | 186,888 | 159,489 | 17.18 |
| Apparent Consumption | 1,427,454 | 1,232,296 | 15.84 |
| **Total Natural Rubber** | | | |
| Imports | 408,436 | 355,093 | 15.02 |
| Exports | 12,570 | 9,064 | 38.68 |
| Apparent Consumption | 389,304 | 343,523 | 13.33 |
| % Total new rubber | 27.27 | 27.87 | |
| **Total Synthetic Rubber** | | | |
| Production | 1,114,878 | 975,402 | 14.30 |
| Imports | 117,182 | 76,244 | 53.69 |
| Exports | 174,318 | 150,425 | 15.88 |
| Apparent Consumption | 1,038,150 | 888,773 | 16.81 |
| % Total new rubber | 72.72 | 72.12 | |
| **Total SBR** | | | |
| Production | 500,430 | 449,735 | 11.27 |
| Imports | 35,298 | 26,577 | 32.81 |
| Exports | 54,613 | 42,051 | 29.87 |
| Apparent Consumption | 459,177 | 433,712 | 5.87 |
| **Total Nitrile** | | | |
| Production | 33,265 | 25,989 | 28.00 |
| Imports | 5,739 | 4,025 | 42.58 |
| Exports | 3,812 | 3,045 | 25.19 |
| Apparent Consumption | 34,952 | 27,051 | 29.21 |
| **Polybutadiene** | | | |
| Production | 184,029 | 160,518 | 14.65 |
| Imports | 33,850 | 17,998 | 88.08 |
| Exports | 11,940 | 7,934 | 50.49 |
| Apparent Consumption | 207,779 | 166,435 | 24.84 |
| **Ethylene-Propylene** | | | |
| Production | 114,719 | 81,615 | 40.56 |
| Imports | 370 | 208 | 77.88 |
| Exports | 17,893 | 16,129 | 10.94 |
| Apparent Consumption | 92,601 | 66,394 | 39.47 |
| **Butyl, Polyisoprene, Silicone and other Synthetic Elastomers** | | | |
| Production | 218,989 | 193,084 | 13.42 |
| Imports | 39,908 | 25,940 | 53.85 |
| Exports | 66,330 | 55,829 | 18.81 |
| Apparent Consumption | 197,112 | 153,561 | 28.36 |
| **Polychloroprene** | | | |
| Production | 63,446 | 64,462 | −1.58 |
| Imports | 2,017 | 1,496 | 34.83 |
| Exports | 19,730 | 25,437 | −22.44 |
| Consumption | 46,528 | 41,621 | 11.79 |

## Markets, news

Lydall, Inc. said its consumer product business of the company's Huntington, IN operation of its elastomer products group is for sale. The company said the Daisy line of consumer household products does not fit with the group's long range strategic plan to be in engineered, custom formulated, precision elastomer products. Lydall is carrying on negotiations to sell the consumer portion of the operation with a local investment group headed by members of Huntington management as well as other parties.

The Biltrite Corp., the leading supplier of shoe soling material to the domestic footwear industry plans to phase out the operations of its Chelsea, MA factory and to consolidate the production of the product lines currently manufactured there into its Ripley, MS plant. In connection with the phaseout, approximately 200 jobs will be eliminated in Chelsea. It is expected that the absorption of the Chelsea production into Ripley will be completed some time in 1985. The move is a direct result of the rapidly decreasing demand for the company's footwear component products caused by the surging increase in imported shoes.

"The August import figures demonstrate that the Senate Finance Committee's request to the International Trade Commission to begin a new investigation into the devastation of the domestic footwear industry by imports didn't come a moment too soon," George Langstaff, president, Footwear Industries of America said. Langstaff said nonrubber footwear imports soared 33.4% in August over 1983 levels accounting for 69 million pairs of shoes. Langstaff also said that imports are up over 35% in 1984 and that more than 50 shoe factories have shut down and domestic production has declined 7.1% this year.

**RMA monthly tire report through July 1984 (figures in 000)**

| Passenger Tires | 1984 | 1983 | % Change |
|---|---|---|---|
| Shipments | | | |
| Original Equipment | 26,972 | 20,571 | 31.12 |
| Radial | 22,543 | 17,151 | 31.44 |
| Replacement | 71,087 | 65,935 | 7.81 |
| Radial | 54,042 | 45,131 | 19.74 |
| Export | 3,100 | 1,880 | 64.89 |
| Radial | 2,286 | 1,248 | 83.17 |
| Total | 101,159 | 88,386 | 14.45 |
| Radial | 78,871 | 63,530 | 24.15 |
| Production | 88,301 | 78,975 | 11.81 |
| Radial | 65,580 | 54,678 | 19.94 |
| **Truck & Bus Tires** | | | |
| Shipments | | | |
| Original Equipment | 3,995 | 2,516 | 58.78 |
| Radial | 2,046 | 1,152 | 77.60 |
| Replacement | 15,137 | 13,483 | 12.27 |
| Radial | 5,197 | 4,349 | 19.50 |
| Export | 674 | 513 | 31.38 |
| Radial | 322 | 242 | 33.06 |
| Total | 19,806 | 16,512 | 19.95 |
| Radial | 7,565 | 5,743 | 31.73 |
| Production | 18,654 | 15,225 | 22.52 |
| Radial | 7,262 | 4,587 | 58.32 |

Representatives of Uniroyal and the United Rubber Workers agreed to a new comprehensive health care program designed to contain rising costs with imposing additional costs on the employees. Pending outcome of the ratification voting, the company and union will not comment publicly.


Now available from Predicasts-

# RUBBER INDUSTRY STUDIES

**• Complete Selection • Perfect for Market Planning • Ideal for Business Development**

**WORLD RUBBER & TIRE MARKETS**
**No. 312 –** Projections to 1995 of rubber production and consumption for 40 countries and regions. Emphasizes natural and synthetic rubber supply and demand and tire production (both OEM and replacement markets). Includes evaluation of tire technology, vehicle production and use, and non-tire rubber demand. Industry structure and corporate profiles are also presented.

**WORLD MOTOR VEHICLES**
**No. 302 –** Analyzes worldwide supply and demand for passenger cars and commercial vehicles in light of demographic, economic, financial, political and social developments. Gives historical and projected data (1987 and 1995) on usage, sales, foreign trade, production and scrappage for both passenger cars and commercial vehicles. Extensive industry structure highlights marketing strategy, financial factors, markets.

**WORLD COMMERCIAL VEHICLES**
**No. 278 –** Projects markets to 1985, 1990 and 1995 for world commercial vehicles trade. Included are demographic and income variables, geographic and political conditions, industrial activity and development, government plans and goals.

**U.S. ENGINEERING THERMOPLASTICS MARKETS**
**No. T60 –** Analyzes historic and future (to 1995) use of high-performance thermoplastic polymers that have properties superior to the olefinic and styrenic materials. Includes plastic consumption of nylon, polycarbonate, acetals, modified polyphenylene oxide, thermoplastic polyesters, polysulfone, polyphenylene sulfide and others. Competition from lightweight materials and reinforced thermosets is reviewed. Major companies are profiled.

**U.S. THERMOPLASTICS MARKETS**
**No. T67 –** Projects markets to 1985, 1990, 1995 for major commodity thermoplastics (high- and low-density PE, polypropylene, polystyrene, PVC, ABS and SAN, acrylics) by process (extrusion, injection molding, blow molding, etc.) and by market (automotive, building, packaging, etc.). Planned capacity by company presented. Pricing, new technology and new applications analyzed.

**U.S. PLASTIC FOAM MARKETS**
**No. T71 –** Part I presents an analysis of plastic foams in the U.S., including rigid and flexible urethanes, polyvinyl chloride, polystyrene and others. 20 end-use markets are projected to 1987 and 1995. Resin consumption and competitive materials are examined. Major companies are profiled along with a detailed industry structure. Short-term developments are reviewed. Part II presents hundreds of article abstracts which summarize information on plastic foams published in the business and trade press over the past 15 months.

**U.S. ADHESIVES & SEALANT MARKETS**
**No. T70 –** Projects (1987, 1995) U.S. demand for synthetic and natural adhesives. Detailed discussion of end-uses (plywood, particleboard, paper products, textiles, transportation, etc.) and types of material (phenolics, urea, epoxies, vinyls, hot-melts, cyanoacrylates, etc.). Short-term trends and detailed industry structure included.

**TEST & MEASURING EQUIPMENT**
**No. E80 –** Part I analyzes U.S. markets for T&M equipment with emphasis on applications and technological innovation. Historical data and forecasts (1987, 1995) are presented for electronic test equipment, electric power meters, electrical indicating instruments, electronic T... over 50 product types within these categories. Automated test equipment receives special attention. Industry structure details competitive variables and profiles major participants. Part II presents abstracts of relevant information published in the business and trade press over the past 15 months.

**WORLD COMMERCIAL...**
**No. 278 –** Projects markets to 1985, 1990, 1995... included are demographic and income variables, geographic and political conditions, industrial activity and development, government plans and goals.

**THE WORLD PASSENGER VEHICLE MA...**
**No. ERC57 –** 3 sections examine... the rest of the world. Investigates... direction of the market economy and its... of vehicle, make, model, engine... Distributed by Predicasts.

**OTHER...**
**No. ERC46 –** Examines... countries of the world... dustry and its... Predicasts.

**THE MARKET... DRIVE CAR...**
**No. ERC39 –** ... the next 5 years. F... and road... Detailed... markets and...

**FACTORY OF...**
**No. E82 –** Examines... markets for... nological factors affecting demand... manufacturing computer systems... and quantity projections (1987, 1995) provide competitive strategies... and profiles of major competitors presented. Manufacturing... puter technology, flexible manufacturing systems, computer-aided manufacturing, group technology and distributed numeric control examined for major opportunities.

**U.S. MATERIAL HANDLING SYSTEM MARKET...**
**No. 294 –** Investigates rapidly changing U.S. material handling equipment market to 1995. Includes transporting, elevating, conveying and transferring equipment and subtypes with special emphasis on materials handling robots. Over 20 industrial and service markets analyzed for major equipment types. Manufacturers, foreign trade, other market factors reviewed.

**WORLD APPLIANCES**
**No. 288 –** Analyzes world demand and production of major appliances including television... refrigerators, washing machines, dishwashers, air conditioners, conventional microwave ovens, cooking equipment. Historic data and projections (through 1995) for more than 10 countries...

**HEATING... COOLING MARKETS**
...dustrial markets for central and space heating... boilers, solar... powered systems, room and central... electrostatic precipitators and other... demand (new and replacement) is examined... analyzed. Leading firms...

**...RY**
...R&D, exports, and overseas production... major assemblers increase their investment... examines the current situation and structure... the strategies of the major... customer and product diversification... R&D strategies. Growth... from IBI.

**...RY**
...easing their overseas investment and further diversifying... study focuses on the fertilizer, soda, agro-... sectors of Japan's basic industry. The... strategies of the major Japanese... for success. Detailed analyses of com... are provided. Published by International... includes 12/83 update from IBI.

**...ALS INDUSTRY**
...market... products and participants in new ceramics, engineering... and amorphous metals. Includes company profiles and analysis... weaknesses. Published by International Business Information.

**...ROOF... & SIDING MARKETS**
– Projects... market for roofing and siding materials to 1988 and 1995 by type... steel, vinyl, brick, hardboard, plywood, lumber and other). Markets are analyzed by use (new residential housing, replacement and addition). Industry structure is examined by producer type (asphalt, wood-based, metal and vinyl) in terms of marketing and distribution strategies, technical and financial requirements. Leading firms are profiled in detail.

**Call us at 800-321-6388 or write.....Predicasts, Inc. 11001 Cedar Avenue Cleveland, OH 44106 for our Free Catalog**

Circle 57 on card

# Brighter days for chemicals, materials

*by Don R. Smith, managing editor*

The rebound in the rubber industry in the United States appears to be stronger now than earlier predictions as most markets are showing better results than were anticipated. The sharp turnaround by the auto industry has forced the debottlenecking of some capacity for chemicals and materials reversing a trend toward mothballing. In 1983 the rubber processing chemical industry operated at a 85% capacity, the highest in 10 years. They operated at 75% in both 1981 and 1982.

The increases in most areas has not come without problems for the domestic suppliers since this has invited many foreign companies to export to the U.S. The increased economic activity, a lag in the economic recovery in other parts of the world and the strength of the U.S. dollar has made the U.S. an attractive market for international firms. The U.S. International Trade Commission reports that elastomer imports during the first quarter of 1984 were up 44% in total pounds over the same period of 1983. A record poundage of imports of elastomers was recorded in 1983 at 1,967 billion pounds, an 8.4% increase over 1982.

The record setting performances by the automakers coupled by rubber inroads into other markets shows up in the increased consumption figures for both automotive and non-automotive elastomers. Consumption of rubber processing chemicals can be tied directly to increases in rubber production. It was thought that even with the reduction of weight of rubber per tire that chemicals might increase usage to enhance aging properties and offer protection to longer lasting tires. But the tire industry reversed itself while rubber chemical consumption continued to drop.

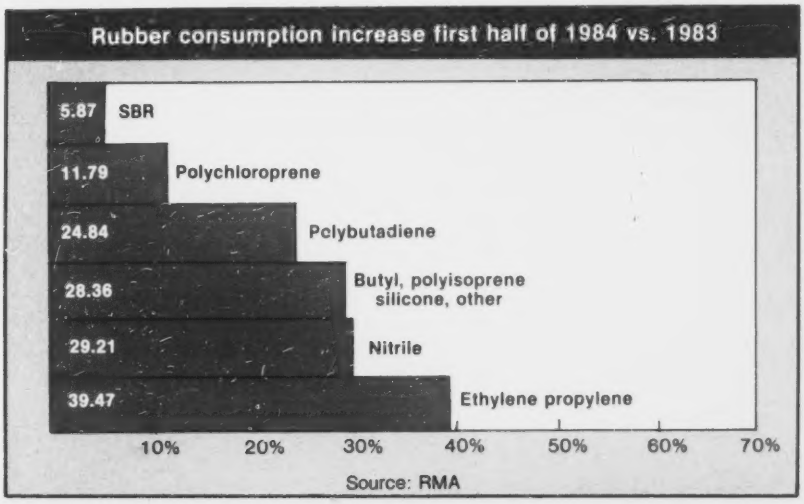
As can be seen in the chart on processing chemical production, poundage produced has declined yearly from 1979 when production was at 394 million pounds to 1982's mark of 232 million pounds which was the lowest total since 1964. The turnaround in production began in the last half of 1983 which is not shown because government figures are not available yet but industry observers seem to think the line will take a 4-6% move upward. A 10%-11% increase is expected for this year but could be higher considering the consumption of rubber is up almost 16% in 1984.

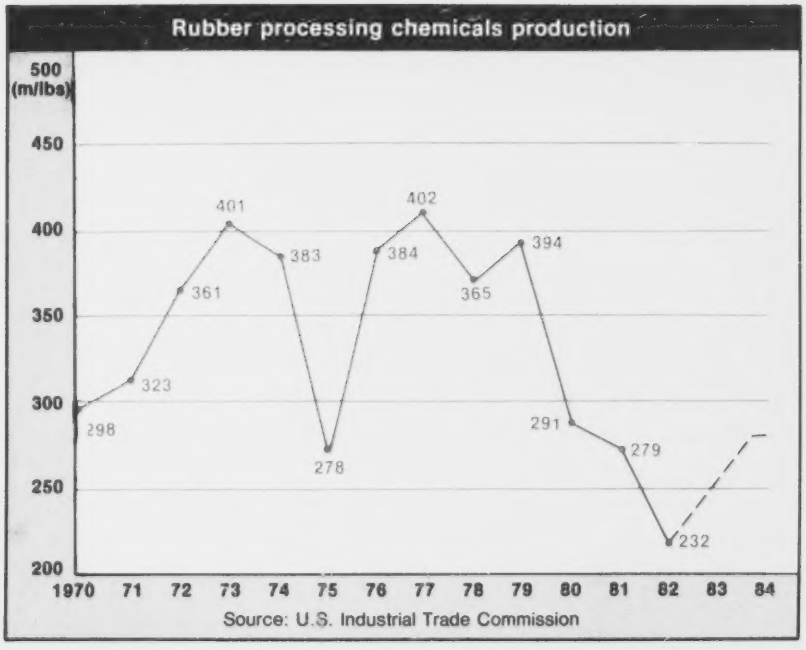
Cyclic rubber processing chemicals account for most of the total produced with acyclic accounting for 17.5% Antioxidants, antiozonanats and stabilizers are the largest group produced accounting for 56% of the total market. Amino compounds account for about 2/3 of this groups' production with phenolics accounting for the other third. Thiazole derivatives are the prime accelerators, activators and vulcanizing agents produced accounting for 93% of the market.

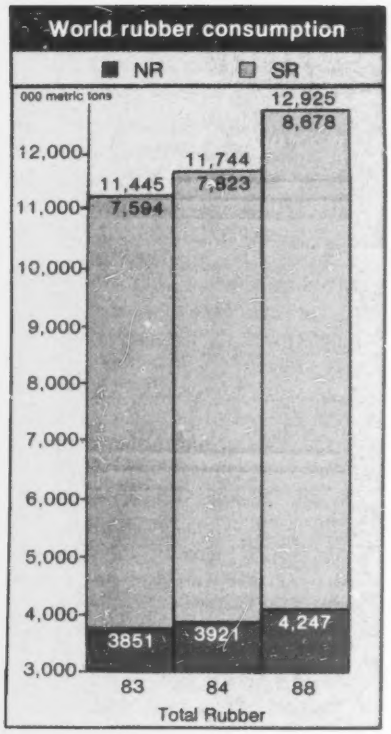
Gauging the market for rubber processing chemicals is difficult because two of the largest suppliers, Goodyear and Uniroyal produce large quantities used captively in their manufacturing operations.

Most chemical producers put an increase in their prices through this past summer at an average of 10-15¢, the first upward movement in prices in almost three years.

Rubber suppliers to the industry weathered the recession that came in with the decade and are experiencing increased sales. With the exception of polychloroprene, all major synthetic rubbers increased production in 1983






**New rubber consumption forecast by region (000 metric tons)**

| | 1982 | 1983 | 1984 | 1988 |
|---|---|---|---|---|
| **Synthetic Rubber** | | | | |
| North America | 1,888 | 1,962 | 2,047 | 2,215 |
| W. Europe, Africa, M. East | 1,487 | 1,506 | 1,532 | 1,634 |
| Asia and Oceania | 999 | 1,087 | 1,104 | 1,242 |
| Latin America | 441 | 439 | 457 | 540 |
| Eastern Europe | 2,400 | 2,430 | 2,500 | 2,800 |
| China/Asian CPEC | 156 | 170 | 184 | 248 |
| TOTAL | 7,371 | 7,594 | 7,823 | 8,678 |
| **Natural Rubber** | | | | |
| North America | 734 | 752 | 778 | 832 |
| W. Europe, Africa, M. East | 964 | 986 | 997 | 1,037 |
| Asia and Oceania | 1,114 | 1,208 | 1,223 | 1,402 |
| Latin America | 168 | 163 | 171 | 198 |
| Eastern Europe | 420 | 420 | 420 | 420 |
| China/Asian CPEC | 306 | 321 | 332 | 378 |
| TOTAL | 3,706 | 3,851 | 3,921 | 4,247 |
| **Total Rubber** | | | | |
| North America | 2,622 | 2,714 | 2,825 | 3,047 |
| W. Europe, Africa, M. East | 2,451 | 2,492 | 2,529 | 2,671 |
| Asia and Oceania | 2,113 | 2,295 | 2,327 | 2,644 |
| Latin America | 609 | 603 | 628 | 738 |
| Eastern Europe | 2,820 | 2,850 | 2,920 | 3,200 |
| China/Asian CPEC | 462 | 491 | 516 | 626 |
| TOTAL | 11,077 | 11,445 | 11,744 | 12,925 |

with further increases during the first half of this year. Consumption of natural rubber, which began its turnaround in 1982 continued through 1983 and onto this year, is also on the increase.

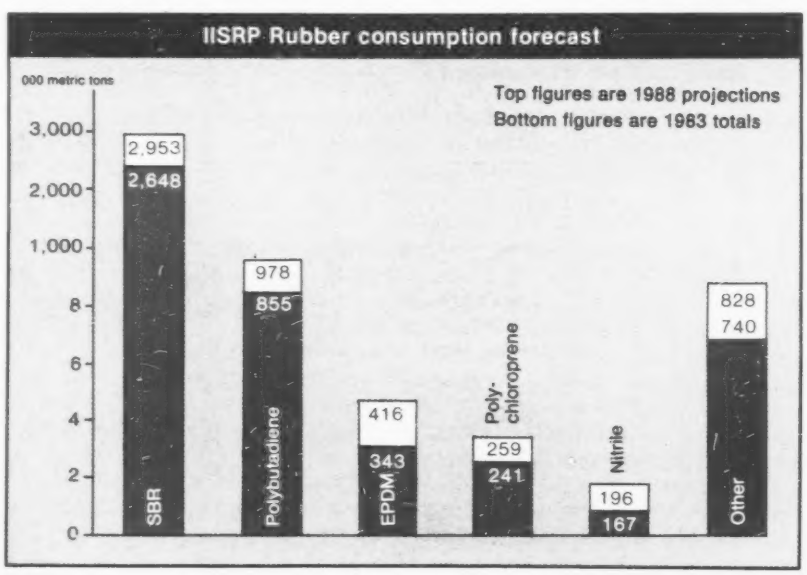
The radialization of the tire industry is a prime reason that natural rubber consumption didn't fall as sharp as that of the synthetics. NR consumption reached a high of 3.87 million metric tons in 1979, declined to around 3.65 mmt in 1982 and rebounded to 3.97 mmt last year. During the first six months of 1984, consumption of NR in the U.S. is up over 13% from the same period of 1983. Worldwide, consumption is up 95,000 metric tons for the first quarter of 1984 compared to 1983.

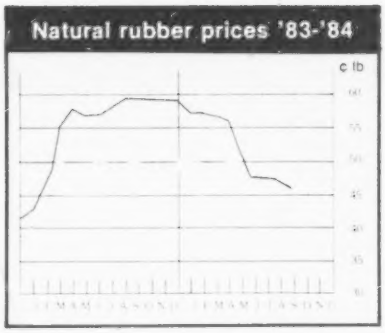
Pricing for the natural rubber producers has been a problem in 1984 with prices declining steadily since February. RSS 1 was selling for 46½¢ a pound in New York in the middle of September. A year earlier the price was 59½¢/lb. In 1980 prices reached 73¢/lb but declined steadily from that point to a low of 44¼¢/lb. in January of 1983. The main natural rubber producing countries, Malaysia, Indonesia and Thailand hope the roller coaster ride of prices is presently at the bottom of the run.

SR consumption rebounded slightly in 1983, a 4% gain over 1982, but 1982 production was lower than any year since 1967. Even production during the oil crisis year of 1975 was higher in the U.S. The International Institute of Synthetic Rubber Producers projects SR demand to rise 3.3% per year for the next five years worldwide but only 2.3% in North America. The IISRP's projection of 2.21 million metric tons of synthetic rubber consumption in 1988 would be the highest figure in the decade but would only be higher than 1975's consumption for that decade.

Stryene butadiene will continue to lead in consumption of synthetics according to the IISRP accounting for 45% of SR consumed. SBR's percentage of the total has been declining because of the smaller, radial tires. The IISRP sees the proportion of total rubber used in tires declining from 61.9% in 1983 to 61.4% but SR will increase its percentage of total rubber used in a tire from 72.3% to 72.7%. Almost two-thirds of SBR production goes into tires.

Ethylene-propylene rubbers are projected for the best growth of the synthetics, with an annual rate slightly higher than 10%. Because of its






emergence in the roofing markets with its single-ply sheets, EPDM producers went through a shorter recession than the others with projections that this roofing will capture an even greater market share. Goodyear says sales of sheet rubber roofing in 1984 will be more than 700 million sq. ft., 17% greater than the predictions made last year, and maybe 30% of the total roofing market which is projected at 2.4 billion sq. ft. The increase in sales is reflected in the figures from the Rubber Manufacturers Association showing EPDM consumption up almost 40% for the first six months of 1984. EPDM consumption rose almost 19% in 1983. If EPDM consumption continues through 1984, almost 184,000 metric tons will be used which would be 21% above projections.

All of the synthetics are performing better than what was projected for the first half of 1984. Total consumption of SR is up almost 17% during the first six months when only modest increases were expected. Besides EPDM, nitrile consumption is up over 29%, polybutadiene increased almost 25%, polychloroprene almost 12% and SBR close to 6%. The other synthetic rubber category consisting of butyl, polyisoprene, silicone and others has increased over 28%.

Although the picture appears to be much better for chemicals and materials suppliers in the U.S., the rise of imports threatens their market share. The U.S. is still considered a net exporter of synthetic rubber and rubber processing chemicals, but the gap is closing. Imports of synthetic rubbers have increased over 53% for the first half of 1984.

The largest jump in imports is with polybutadiene (88%) EPDM (77%) and the category including butyl, polyisoprene and silicone (53%). Other import increases are: SBR up 29%; nitrile up 42%; and polychloroprene up 34%.

Face it. We could all use a little concrete advice now and then.

Whether you're making a monumental decision like a career change, or a more routine one like an oil change, the free Consumer Information Catalog can make it easier.

The Catalog is published quarterly by the Consumer Information Center of the U.S. General Services Administration to bring you the latest on government programs and a mountain of other information that you can use.

The Catalog lists more than 200 government booklets to help you . . . start a business, find a job, plan your retirement, repair your home, or carve out a nutrition and exercise program to improve your profile. And many of these booklets are free.

So order your Catalog today. Any way you look at it, you'll be head and shoulders above the crowd.

Just send your name and address on a postcard to:

**Consumer Information Center**
**Dept. MR**
**Pueblo, Colorado 81009**

A public service of this publication and the Consumer Information Center of the U.S. General Services Administration